ENVIRONMENTAL PROTECTION AGENCY

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

[FRL-3153-5]

Burning of Hazardous Waste in Boilers and Industrial Furnaces

AGENCY: Environmental Protection Agency.

ACTION: Proposed rule and request for comment.

SUMMARY: Under this proposal, the Environmental Protection Agency (EPA) would expand controls on hazardous waste combustion to regulate the burning of hazardous waste fuels in boilers and industrial furnaces. Currently, only the burning of hazardous waste in incinerators is subject to regulation although burning hazardous waste fuels in boilers and industrial furnaces can pose similar hazards to human health and the environment. Boilers and industrial furnaces have been exempt from regulation pending Agency efforts to determine whether regulations for burning in these devices should differ from those for incineration in light of the different scope of practices and the different combustion devices and wastes involved. The Agency has completed those efforts and today proposes to control emissions of toxic organic compounds, toxic metals, and hydrogen chloride from boilers and industrial furnaces burning hazardous waste. In addition, today's proposal would subject owners and operators of these devices to the general facility standards applicable to hazardous waste treatment, storage, and disposal facilities. Further, today's proposal would subject hazardous waste fuel storage units at burner facilities to Part 264 permit standards. Burner storage operations at existing facilities are generally now subject only to interim status standards under Part 265.

Finally, today's rule proposes action on two petitions. Based on a petition by Dow Chemical Corporation, the Agency is proposing to classify halogen acid furnaces as industrial furnaces under § 260.10. Based on a petition by the American Iron and Steel Institute, EPA is proposing to classify coke and coal tar fuels produced by recycling coal tar decanter sludge, EPA Hazardous Waste No. K087, as products rather than solid waste.

DATES: EPA will accept public comments on this proposed rule until July 6, 1987, except that comments on the proposal to regulate hazardous waste fuel blending tanks will be accepted until June 5, 1987.

Public hearings are scheduled as follows:

1. Chicago, May 27, 1987.
2. San Francisco, May 28, 1987.
3. Arlington, VA, June 5, 1987.

Requests to present oral testimony must be received by 10 days before each public hearing.

ADDRESSES: Comments on this proposed rule should be sent to RCRA Docket Section (WH-562), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460 [Attn: Docket No. F-87-BBFP-FFFFF]. The public docket is located in Rm. S-212 and is available for viewing from 9 a.m. to 4 p.m., Monday through Friday, excluding legal holidays. The hearings will be held at the following locations:

1. Holiday Inn—O'Hare, 5440 N. River Road, Rosemont, Illinois 60018, May 27, 1987.

2. Holiday Inn—Fisherman's Wharf, 1300 Columbus Avenue, San Francisco, California 94133, May 28, 1987.

3. Sheraton-National Hotel, Columbia Pike and Washington Blvd., Arlington, VA 22204, June 5, 1987.

The hearings will begin at 9 a.m. with registration at 8:30 a.m. and will run until 4:30 p.m. unless concluded earlier. The meetings may be adjourned earlier than the scheduled time if there are no remaining comments. Anyone wishing to make a statement at the hearing should notify, in writing, Mr. William Richardson, Public Participation Office, Office of Solid Waste (WH-562), Environmental Protection Agency, 401 M Street SW., Washington, DC 20460. Persons wishing to make oral presentations must restrict them to 15 minutes and are encouraged to have written copies of their complete comments for inclusion in the official record.

FOR FURTHER INFORMATION CONTACT: RCRA HOTLINE, toll free, at (800) 424-9346 or at (202) 382-3000. Single copies of the proposed rule are available by calling the RCRA Hotline. For technical information, contact Dwight Hlustick, Waste Combustion Section, Waste Management Division, Office of Solid Waste, WH-565A, U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460, Telephone: (202) 382-7917.

SUPPLEMENTARY INFORMATION:

Preamble Outline

Today's preamble is organized into six 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 combustion units that would be regulated—boilers and industrial furnaces—and describes the hazard that may be posed by the uncontrolled burning of hazardous waste.

Part Two discusses why the proposed controls are based on national performance standards rather than entirely on case-by-case risk assessments. This part also discusses why the rules would apply to the burning of hazardous waste in boilers or industrial furnaces irrespective of the heating value of the waste. Thus, these rules would supercede the sham recycling enforcement policy that heretofore applied the hazardous waste incinerator standards of Subpart O of Parts 264 or 265 to the burning of low heating value hazardous waste in boilers or industrial furnaces. Under today's rules, the incinerator standards of Subpart O would never apply to boilers and industrial furnaces. This part also explains that today's rules would apply to the burning of hazardous waste in an industrial furnace solely for the purpose of materials recovery, but also explains when such burning is deemed not to involve RCRA solid wastes.

Part Three discusses the proposed controls on burning. It explains why emissions of toxic organic compounds are controlled with a 99.99 percent destruction and removal efficiency (DRE) performance standard coupled with limits on flue gas carbon monoxide (CO) levels. The DRE standard would ensure destruction of organic constituents in the hazardous waste fuel and the CO limits would ensure the device continuously operates at high combustion efficiency and, thus, is not likely to emit incompletely burned organics at levels that pose significant risk. This part also discusses the proposed automatic waiver of a trial burn for boilers operated under special conditions. The special conditions were developed to ensure that the boiler continuously operates at high combustion efficiency when burning hazardous waste and, thus, achieves at least a 99.99 percent DRE for constituents in the feed, and has minimal emission of incompletely burned organic compounds. In addition, this part discusses the proposed waiver of a trial burn and the flue gas carbon monoxide limits for boilers and industrial furnaces demonstrated to burn low risk waste. The demonstration is based on projected reasonable, worst-case emission rates absent those controls, site-specific dispersion modeling, and comparison of predicted ground level concentrations of pollutants to reference levels. Part Three also discusses the basis for the proposed limits on metals and hydrogen chloride emissions, and the four-tiered approach to implement those limits: Tier I—demonstration of compliance with metals and chlorine specification levels in the hazardous waste itself, or in the hazardous waste as fuel (i.e., after blending); Tier II—demonstration that the feed rate of metals and chlorine, considering levels in the hazardous waste, other fuels, and industrial furnace feedstocks, does not exceed prescribed limits; Tier III—demonstration that prescribed emission rates are not exceeded; and Tier IV—

demonstration that reference air concentrations are not exceeded. An owner or operator would be in compliance by demonstrating conformance with any of the tiers. In addition, this part discusses the proposed exemption of small quantity onsite burners and the regulation of combustion residuals.

Part Four discusses proposed interim status standards and permit standards and procedures. In particular, this part discusses how the CO limits and metals and HCl standards would apply during interim status.

Part Five discusses subjecting existing burner storage units currently in interim status to the Part 264 permit standards at the same time the boiler or industrial furnace is permitted. On-site burners who accumulate hazardous waste for less than 90 days, however, will continue to be subject to the special requirements under § 262.34. This part also discusses a proposal to designate halogen acid furnaces as industrial furnaces and attempts to distinguish clearly between such furnaces and incinerators burning halogenated hazardous waste. In addition, this part discusses a proposal to classify coke and coal tar fuels produced by recycling coal tar decanter sludge, EPA Hazardous Waste No. KO87, as products rather than solid (and hazardous) waste because the recycling does not significantly increase the levels of toxic constituents in the materials. Further, Part Five discusses the Agency's intent to develop conforming amendments to the incinerator standards of Subpart O of Parts 264 and 265 to control metals emissions directly and to ensure that incinerators continuously operate at high combustion efficiency to help minimize emissions of incompletely burned organic compounds. Finally, this part addresses two unrelated issues: (1) A proposal to clarify that the pickle liquor listing, Hazardous Waste No. KO62, applies to pickle liquor generated by plants in the iron and steel industry, not just to plants that actually produce iron and steel: and (2) a proposal to amend an exemption provided in the November 29, 1985, burning and blending final rule for gas recovered from hazardous waste landfills to extend the exemption to include gas recovered from solid waste landfills.

Part Six discusses how the rules would operate immediately upon promulgation, even in States authorized to operate the hazardous waste program. This part also discusses the economic impacts the rule would have on the regulated community. EPA notes that any final rules would be codified differently from today's proposal. The Agency intends to codify these final rules in a new subpart of Part 266.

Part One: Background

I. Legal Authority

These regulations are proposed under the authority of Section 1006, 2002(a), 3001, 3004, 3005, and 3007 of the Solid Waste Disposal Act 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(a), 6921, 6924, 6925, and 6927.

II. Overview of the Proposed Rule

EPA is proposing today to expand controls on burning hazardous waste to regulate burning in boilers and industrial furnaces. These proposed rules are similar to the Agency's standards for owners and operators of hazardous waste incinerators under Parts 264 and 265. Owners and operators of boilers and industrial furnaces would be subject to the general facility standards for hazardous waste treatment, storage, and disposal facilities, including requirements concerning emergency procedures, closure, and financial assurance. Permit requirements would be similar to those for incinerators[1] in that controls would limit the emission of toxic organic compounds, toxic metals, and hydrogen chloride. However, these rules would differ from the controls for incinerators in several important ways. In addition to requiring a 99.99 percent destruction and removal efficiency (DRE) of principal organic hazardous constituents (POHCs) in the hazardous waste feed, these rules would attempt to minimize the emission of incompletely burned organic compounds by limiting the flue gas concentration of carbon monoxide, thus ensuring the device operates continuously at high combustion efficiency. These rules would also provide direct control of metals emissions, and would control metals and hydrogen chloride emissions with risk-based standards. In addition, trial burns would be automatically waived for boilers meeting special operating requirements. Finally, to make the rules as cost-effective as possible, we are proposing discretionary alternative standards based on a common principle—ground level concentrations of pollutants emitted from the facility must protect public health and the environment. Thus, today's rules would have optional requirements, some of which require site specific risk assessment.

These proposed rules would apply to burning of hazardous waste in boilers and industrial furnaces irrespective of whether the waste has minimal energy value. In addition, these rules would also apply to the burning of hazardous waste in an industrial furnace solely for the purpose of materials recovery.

These rules would also apply to the burning of hazardous waste in nonindustrial as well as industrial boilers. Thus, these rules would supercede the November 29, 1985, Administrative Controls that require owners and operators of nonindustrial boilers burning hazardous waste fuel to comply with the incinerator standards of Subpart O of Parts 264 or 265.

In addition, these rules would exempt on-site burners of small quantities of hazardous waste on the basis that the extremely small quantities of hazardous waste involved are not likely to pose significant risks.

Finally, today's proposal would subject existing hazardous waste storage facilities used by burners to final permit standards. Currently, existing storage operations (in existence on May 29, 1985) at burner facilities are subject generally only to interim status storage standards. On-site burners who accumulate hazardous waste for less than 90 days, however, will continue to be subject to the special requirements under § 262.34.

III. Relationship of the Proposed Rule to Other Rules

A. May 19, 1980, Rules

The initial hazardous waste management facility standards promulgated on May 19, 1980, controlled the burning of hazardous waste in incinerators, but exempted the burning of hazardous waste for the purpose of energy recovery. EPA did not promulgate controls for the burning of hazardous waste for energy recovery in boilers and other devices at that time because the Agency had not investigated the extent of the practice, the risks that may be posed to human health or the environment, or regulatory alternatives. Since that time, EPA has been considering what controls on the burning of hazardous waste for energy recovery may be needed. The Agency accelerated those efforts when the

[1] The incinerator standards of Subpart O, 40 CFR Part 264, control emissions of organic constituents in the waste with a technology-based 99.99% destruction and removal efficiency (DRE) standard, and control particulate and hydrogen chloride emissions with technology-based emission limits.

Hazardous and Solid Waste Amendments of 1984 explicitly required the Agency to address the issue.

Although the 1980 rules exempted the burning of hazardous waste for energy recovery, the storage and transportation of certain hazardous wastes destined for energy recovery were regulated prior to recycling. The storage and transportation of hazardous wastes that were listed wastes or sludges were regulated when the wastes were burned on-site or sent directly from the generator to the burner. When these wastes were sent to an intermediate processor or blender, however, they were considered to be recycled once they were processed or blended and, thus, exempt from further regulation. Wastes that were hazardous solely because they exhibited a characteristic (and that were not a sludge) were totally exempt from regulation when destined to be burned for energy recovery.

To ensure that hazardous waste typically destined for incineration because of its low heating value was not burned in a boiler or industrial furnace, ostensibly for energy recovery but actually to avoid the cost of incineration, the Agency developed a sham recycling policy in 1983 which was of questionable effect. See 48 FR 11157 (March 16, 1983). That policy held that if a hazardous waste having less that 5,000 to 8,000 Btu/lb heating value were burned in a boiler or industrial furnace, it was not burned for its fuel value but rather to avoid the cost of incineration. As discussed in Section II of Part Two, that policy would be superceded by today's proposed rule. Hazardous waste, irrespective of its heating value, would be subject to today's proposed rule when burned in a boiler or industrial furnace.

B. January 4, 1985, Redefinition of Solid Waste

On January 4, 1985, EPA promulgated revisions to the definition of a solid waste (50 FR 665) that established, in Part 266, a Subpart D for "Hazardous Waste Burned for Energy Recovery." With one exception explained below, that subpart did not change the substantive controls established by the 1980 rules for hazardous waste fuels. The rule made it clear that listed wastes and sludges are subject to transportation and storage controls prior to burning and prior to processing or blending to produce a waste-derived fuel by a person who neither generated the waste nor burns the fuel. Thus, a generator could no longer engage in minimal or incidental processing and blending of a listed waste or sludge and claim that he produced hazardous waste-derived fuel exempt from transportation and storage controls.

C. November 29, 1985, Administrative Controls

On November 29, 1985, EPA promulgated administrative controls for marketers and burners of hazardous waste fuels. See 50 FR 49164–49211. That rule revised the controls on hazardous waste fuels substantially as follows: (1) The rule applied storage, transportation, and certain administrative (paperwork) controls to all hazardous wastes used as fuels or used to produce a fuel, and to all hazardous waste-derived fuels (i.e., wastes that were hazardous solely because they exhibited a characteristic were no longer exempt, and hazardous waste-derived fuels produced by third-party processors and blenders were no longer exempt); and (2) the rule prohibited the burning of hazardous waste fuel in nonindustrial boilers, unless the boiler complied with the standards for hazardous waste incinerators under Subpart O of Parts 264 and 265. Today's proposed rule would change the November 29 rule by establishing technical controls for burners, by allowing nonindustrial boilers to burn hazardous waste fuels under those controls, and by eliminating a paperwork requirement (one-time notice from a burner to the marketer certifying that the burner has notified EPA of his activities and will burn the hazardous waste fuel only in unrestricted boilers).

D. TSCA Waste PCB Rules

EPA controls the disposal of wastes containing PCBs (polychlorinated biphenyls) under authority of the Toxic Substances Control Act. Standards for PCB disposal are promulgated at 40 CFR Part 761 and apply to management practices including incineration and burning in boilers.

Although the Agency is in the process of integrating the TSCA PCB disposal rules with the RCRA hazardous waste rules, that effort has not been completed. Thus, today's rules do not apply to waste PCBs, with one important exception. If a waste PCB is also a RCRA hazardous waste (e.g., because it exhibits a characteristic or because it is mixed with a RCRA-listed hazardous waste), any fuel that contains or is derived from the waste would be subject to today's rule as well as the TSCA PCB rules. In practice, this means that the permitting official would apply the more stringent of the TSCA or RCRA rules.

E. Proposed Rules for Burners of Off-Specification Used Oil Fuels

The Agency will in the future be proposing management standards for owners and operators of boilers and industrial furnaces burning off-specification used oil fuels. Any metals and hydrogen chloride controls deemed necessary for off-specification used oil may be patterned after the rules proposed here. If the Agency is concerned about organic emissions from the burning of certain off-specification used oil fuels, the Agency may propose to subject some used oil fuels to the destruction and removal efficiency and carbon monoxide standards proposed here for hazardous wastes.

Today's rules would apply to used oil only if the used oil is mixed with a hazardous waste. Used oil that contains more than 1000 ppm total halogens is presumed to be mixed with hazardous waste unless the presumption is rebutted. See 50 FR 49164 (November 29, 1985).

IV. Need for Controls

Today's proposed rule would apply to boilers and industrial furnaces that burn hazardous waste.[2] EPA has defined boiler, industrial furnace, and incinerator in 40 CFR 260.10. Under those definitions, enclosed devices using controlled flame combustion are considered to be incinerators if they do not meet the definition of a boiler and if they are not designated as an industrial furnace. Incinerators are regulated under Subpart O of Parts 264 and 265. Boilers and industrial furnaces would be regulated under today's rule.

In this section, we summarize hazardous waste burning practices in boilers and industrial furnaces and describe the risks that can be posed by improper burning.

A. Boilers

EPA defines a boiler in 260.10 as an enclosed device using controlled flame combustion and having the following characteristics: (1) the combustion chamber and primary energy recovery section must be of integral design (e.g., facilities with waste heat recovery boilers attached to incinerators are not considered boilers); (2) thermal energy recovery efficiency must be at least 60 percent; and (3) at least 75 percent of the

[2] As discussed in Section II of Part Two of the text, today's rule would apply to the burning of hazardous wastes in boilers and industrial furnaces irrespective of the heating value of the hazardous waste. Thus, these rules would regulate burning in these devices for energy recovery as well as for the burning of low heating value wastes (i.e., less than 5,000 Btu/lb) for the purpose of destruction.

recovered energy must be "exported" (i.e., not used for internal uses like preheating of combustion air or fuel, or driving combustion air fans or feedwater pumps).

Today's rule would apply to all boilers burning hazardous wastes: [3] nonindustrial (residential, commercial, and institutional), industrial, and utility boilers. Currently, nonindustrial boilers are prohibited from burning hazardous wastes unless they are operated in conformance with the incinerator standards of Subpart O of Parts 264 or 265. See 50 FR 49192. EPA was concerned about the special risks posed by the uncontrolled burning of hazardous waste in nonindustrial boilers given their typical location, size, and operating practices. Given that today's proposed rule would establish standards designed to be protective when hazardous waste is burned in any boiler, the rule would eliminate the distinction between nonindustrial boilers on the one hand and industrial and utility boilers on the other. Once today's rule is promulgated (and effective), any nonindustrial boilers burning hazardous waste under Subpart O of Parts 264 or 265 would be subject to the final standards for boilers.

Based on a mail questionnaire survey,[4/5] EPA believes that approximately 900 boilers burn hazardous waste fuels. The boilers range in size from very small boilers with a heat input capacity of less than 5 million (MM) Btu/hr to huge utility-class boilers with a heat input capacity of several thousand MM Btu/hr. The hazardous wastes burned in boilers are generally organic by-products from chemical manufacturing and spent solvents either generated on-site or by a similar facility, and have heating values ranging from 8,000 to 15,000 Btu/lb, with average values of approximately 10,000 Btu/lb. Many, perhaps 25 percent, of the boilers burn very small quantities of hazardous waste—less than 50 gallons/month. Some boilers, however, burn hazardous waste as the sole fuel. Typically, hazardous waste is burned with fuel oil or natural gas and provides less than 50 percent of the boiler's fuel requirements. Less often, hazardous wastes are cofired with pulverized coal, stoker coal, or other fuels.

Based on available data and information from industry representatives, hazardous wastes burned in boilers usually have low metals and chlorine content. This is fortuitous because boilers cofiring hazardous waste with oil or gas are generally not equipped with emissions control equipment because there generally is no need to control particulate emissions from oil or gas fired boilers. To meet today's proposed controls on metals and hydrogen chloride emissions, boilers burning metals or chlorine-bearing wastes may have to cofire with oil or gas at low waste firing rates, blend the metal or chlorine-bearing wastes with other wastes or fuels, or employ emissions control devices to remove metals and hydrogen chloride from exhaust gases.

B. Industrial Furnaces

EPA defines industrial furnaces in § 260.10 as those devices that EPA has determined are enclosed devices using controlled flame combustion to recover (or produce) materials or energy as an integral component of a manufacturing process. EPA has designated 11 devices as industrial furnaces and has developed criteria and procedures for so designating additional devices. To date, the Agency has designated the following devices as industrial furnaces: cement kilns; lime kilns; aggregate kilns (including light-weight aggregate kilns and aggregate drying kilns used in the asphaltic concrete industry); phosphate kilns; coke ovens; blast furnaces; smelting, melting, and refining furnaces; titanium dioxide chloride process oxidation reactors; methane reforming furnaces; pulping liquor recovery furnaces; and combustion devices used in the recovery of sulfur values from spent sulfuric acid. In addition, EPA is proposing today to amend § 260.10 to designate halogen acid furnaces as industrial furnaces. See Section II of Part Five.

Any hazardous waste burned in these industrial furnaces would be regulated under today's rule, except those wastes exempted by § 266.30(b) (e.g., small quantity generator hazardous waste and waste excluded from regulation under § 261.4). (Furnaces which burn hazardous wastes solely for materials recovery are also regulated in today's rule. See discussion in Section II.B of Part Two for which materials would be considered to be solid and hazardous wastes when so burned.)

Based on the Westat report (see footnote 4) and information received from industry, EPA estimates that approximately 50 industrial furnaces burn 100 to 150 million gallons of hazardous waste as fuel annually. Cement and light-weight aggregate kilns appear to burn the bulk of the wastes, although sulfur recovery furnaces are believed to burn some hazardous waste as fuel. In addition, blast furnaces have burned on the order of 25 million gallons annually in the past. Finally, lime kilns have been tested to determine that they can successfully burn hazardous waste fuels.

Industrial furnaces (particularly cement kilns, light-weight aggregate kilns, and blast furnaces) typically burn blended solvents and solvent recovery distillation bottoms generated off-site. As opposed to most boilers, industrial furnaces typically act as commercial facilities, handling for a fee wastes generated by others. After blending, the hazardous waste fuel typically has a heating value of 10,000 Btu/lb or more, a chlorine content of 1 to 3 percent, and very high levels of metals. Levels of cadmium and chromium can be as high as several hundred ppm, and lead levels can range from several hundred ppm to more than 4,000 ppm. Notwithstanding the high levels of metals and chlorine in the hazardous waste fuel, industrial furnaces can generally be expected to emit low levels of metals and hydrogen chloride because the metals and chlorine are removed from the combustion gases by process reactions or by stack emissions control equipment. Industrial furnaces are generally ideally suited to burn metal and chlorine-bearing hazardous wastes (e.g., ignitable and chlorinated spent solvents and solvent recovery distillation bottoms) and are expected to be readily able to comply with the metals and hydrogen chloride emission limits proposed today.[6]

Each of the industrial furnaces known to be burning or to have been tested for burning hazardous waste fuels is described below.

1. *Cement kilns.* Cement kilns are horizontal inclined rotating cylinders, refractory lined and internally fired, to calcine a blend of 80 percent limestone and 20 percent shale to produce Portland cement.

There is a wet process and a dry process for producing cement. In the wet process, the limestone and shale are ground wet, whereas in the dry process kiln they are ground dry. Wet process kilns are longer than dry process kilns in order to facilitate water evaporation from the wet feed. Otherwise, the two processes are basically identical, with similar process chemistry and equipment.

[3] Except certain hazardous waste exempted by § 266.30(b) (50 FR 49204 (November 29, 1985)).

[4/5] WESTAT, *Final Report for the Survey of Waste As Fuel: Track II*, November, 1985.

[6] Industrial furnaces, e.g., light-weight aggregate kilns equipped with low pressure wet scrubbers may not be able to burn metal-bearing hazardous waste fuels under today's proposed rule unless air pollution control equipment is upgraded.

Kilns are operated counterflow with solids flow counter-current to combustion gases and traveling down the slight incline of the kiln (i.e., raw materials are fed into the upper end of the kiln, fuel is fired at the lower end, and the raw materials get progressively hotter as they travel the length of the kiln).

Combustion gases leaving the kiln typically contain 6–30% of the feed solids as dust, water vapor, up to 30% CO_2, 10–1000 ppm CO, 10–2000 ppm SO_2 and 100–1500 ppm NO_x. The gases are transported to pollution control equipment by an induced draft fan. Combustion in the kiln supplies heat at the rate of about 3–6 million Btu per ton of product by burning fossil fuel, primarily coal. Coal ash and fly ash are chemically similar to cement and remain with the cement product (i.e., fly ash is removed from exhaust gases as discussed below and is often returned to the kiln).

Cement kilns are major sources of particulate emissions and are regulated by EPA and the States. Kiln emissions are controlled by multistage cyclones and electrostatic precipitators (ESP) or fabric filters. Kiln dust collected from primary cyclones and ESPs are generally recycled to the kiln feed.

Cement kilns are typically controlled by controlling the fuel firing rate and combustion air to maintain temperatures between 2,250 to 2,700 °F for cementation to clinker formation. Gas residence time ranges from greater than two seconds for dry process kilns to 10 seconds for wet process kilns.

There are approximately 275 cement kilns operating in the United States today, of which on the order of 20 to 30 are burning hazardous waste fuel. Given that hazardous waste fuel is often cofired with coal at a 50 percent firing rate, and that the typical cement kiln has a total heat input requirement of 160 million Btu/hr, EPA estimates that 30 million gallons of hazardous waste are burned in cement kilns annually.

2. *Light-weight aggregate kilns.* Light-weight aggregate (LWA) describes a special use aggregate with a specific gravity much less than sand and gravel, which is used to produce insulation, and nonstructural and lightweight structural concrete. LWA is produced much like cement, but the feedstocks are special clays, pumice, scoria, shale, or slate.

The LWA kiln is configured much like a cement kiln. The raw material is crushed and introduced at the upper end of a rotary kiln. In passing through the kiln, the materials reach temperatures of 1,900 to 2,100 °F. Heat is provided by a burner at the lower kiln end where clinker is discharged. Heat requirements may range from 3 to 6 million Btu per ton of thruput. Fuels include natural gas, oil, and coal with a trend toward increasing coal use.

LWA kilns are also major sources of particulate emissions and are equipped with wet scrubbers, fabric filters, or electrostatic precipitators (ESPs). Wet scrubbers dominate the industry, with fabric filters following.

There are some 30 LWA plants in 24 States, each with two or more kilns. Approximately 25 LWA kilns are burning 30 million gallons of hazardous waste annually, usually as the sole fuel.

3. *Lime kilns.* Lime kilns calcine limestone in direct-fired furnaces that can be rotary kilns, fluidized bed kilns, vertical shaft kilns or rotary hearth kilns. Ninety percent of lime production in the U.S., however, is produced from limestone in horizontal rotary kilns similar in configuration to cement kilns. The calcination reaction is a decomposition to calcium oxide and CO_2 and occurs between 1,350 to 1,650 °F, with dolomitic limestones decomposing at the lower temperatures. Lime kilns operate at 1,800 to 2,300 °F and require a heat rate of about 7 million Btu per ton of thruput. Coal accounts for almost 70 percent of the fuel used in lime production and natural gas is used for some 23 percent of production. Oil and other fuels comprise the remaining percentage of fuel use.

Feedstocks are limestones with varying amounts of dolomite (magnesium carbonates) and other compounds similar to those used in cement manufacture. The limestones are crushed and dried before feeding. Kiln gases exit between 500 to 1,400 °F and kiln emissions are controlled with fabric filters, ESPs, Venturi scrubbers, and gravel bed filters.

Although test burns with lime kilns have demonstrated that they can effectively burn hazardous waste fuels, EPA is not aware of any lime kilns currently burning hazardous waste. EPA believes, however, that there is considerable interest within the industry and that commercial hazardous waste fuel burning operations may be initiated in the near future.

4. *Blast furnace systems.* A blast furnace is a vertical shaft furnace that uses carbon in the form of coke to reduce iron oxide ores to iron in a chemically-reducing atmosphere by the action of carbon monoxide (CO). CO is formed primarily by oxidizing carbon (i.e., coke) to CO with preheated air (blast air).

Solid raw materials (ore, coke, flux) are charged into the top of the blast furnace and preheated air is "blasted" through tuyeres near the bottom of the furnace. Frequently, hydrocarbon additives (gas, liquid, or solid) or oxygen are also injected through the tuyeres. Present practice typically includes injecting fuel oil through the tuyeres.

The gases exiting from the top of the furnace (top gas) have high CO levels. The top gas from the blast furnace is generally cleaned of particulates by cyclones and wet scrubbers and then used as fuel primarily in air preheating stoves and on-site boilers.

The stoves are vertical furnaces that preheat the blast air by indirect heating of the air conveying chambers in the stoves to approximately 1,600 °F. The stoves are equipped with burners capable of efficiently utilizing blast furnace top gas for fuel.

The boilers are conventional stationary steam raising facilities which are equipped with fuel burners that are also capable of efficiently utilizing blast furnace top gas for fuel.

The top gas is also typically used as fuel in coke ovens, reheat furnaces, and internal combustion engines. Some of the top gas is also wasted by flaring. EPA has received data on 18 blast furnace system facilities operated by seven companies that show that the mean top gas utilization at these facilities is as follows:

Blast Furnace Top Gas Utilization as Fuel

	Percent
Stoves	41.33
Boilers	52.20
Coke Ovens	2.03
Reheat Furnaces	1.16
I/C Engines	.025
Venting or Flaring	3.03

Source: Letter from Robert L. Champbell, Campbell & Pryor Assoc. Inc., to Robert Holloway, EPA, June 2, 1986.

Until recently, hazardous waste was blended with fuel oil in about a 50/50 blend and used as a fuel injectant by the LTV Steel Company. Before the company stopped accepting hazardous waste fuels in the spring of 1986, approximately 25 million gallons of hazardous wastes were burned annually in five blast furnaces.[7] Although EPA is not aware of blast furnace systems burning hazardous waste fuels at this time, the Agency believes that blast furnace systems can comply with the requirements proposed today, and, thus, safely burn hazardous waste fuels.[8]

[7] EPA understands that the LTV Steel Company chose not to comply with the hazardous waste fuel storage standards that became effective on May 29, 1986, and thus terminated their hazardous waste fuel activities.

[8] Radian Corporation, *Destruction and Removal of POHCs in Iron Making Blast Furnaces,* December 31, 1985.

5. *Sulfur recovery furnaces.* Sulfur recovery furnaces are used by sulfuric acid plants to process spent (used) sulfuric acid and other sulfur bearing wastes. The spent acid is contaminated with water, organics, inorganics, and other materials from prior acid use.

In the sulfur recovery furnace, spent acid, elemental sulfur, hydrogen sulfide, and other sulfur-bearing wastes are thermally decomposed at elevated temperatures into sulfur dioxide (SO_2), carbon monoxide (CO), carbon dioxide (CO_2), and water vapor. SO_2 concentrations are generally up to 14 volume percent and temperatures are usually controlled to 2,000 °F in order to reduce formatión and emissions of nitrogen oxides.

The furnace is generally a horizontal, cylindrical, refractory-lined chamber and the feed sulfur, spent acid and/or other sulfur-bearing wastes are sprayed into the furnace where they are contacted with dried combustion air. Waste feed rates are controlled to achieve 8 to 14 percent SO_2 in furnace exhaust gases. After cleaning, exhaust gases are passed through converted catalyst beds to recover the sulfur.

When large quantities of spent acid comprise the feedstock, the reaction with oxygen in air is endothermic and supplementary fuel firing is required. A conventional fuel burner system is generally installed and combustion control is typically based on reaction temperature and excess oxygen. This conventional burner system may be used for firing combustible hazardous wastes.

Sulfur recovery plants use emission control devices to clean the gas stream prior to entering the converted catalyst beds to remove particulates, metals, and hydrogen chloride (HC1) to avoid contaminating or plugging the catalyst beds. Downstream of the converter beds, the exit gases are controlled to limit emissions of sulfur dioxide (SO_2) and acid mist. Preconverter controls can be cyclones, scrubbers, electrostatic precipitators, or gas dryers. Post-converter controls can be: (1) For SO_2 control, alkali absorption systems, sodium sulfate to bisulfate scrubbers, and ammonia scrubbers; and (2) for acid mist control, electrostatic precipitators, packed bed scrubbers, and molecular sieves.

C. Risks Posed by Improper Burning

The burning of hazardous waste in boilers and industrial furnaces can pose the same risks as burning in incinerators. Emissions of incompletely burned toxic organic constituents in the waste, emissions of toxic metal constituents in the waste, and emissions of hydrochloric acid (HC1) resulting from burning highly-chlorinated wastes can pose significant risk to human health. As discussed in Part Three of this preamble, emissions of toxic organic compounds from poorly-operated boilers and industrial furnaces could result in an increased lifetime cancer risk of 10^{-4} (i.e., 1 in 10,000) to persons exposed to the maximum annual average ground level concentration. Similarly, emissions of toxic metals from devices burning metal bearing wastes without adequate emission controls could pose risks at those levels. Finally, emissions of hydrogen chloride (HC1) from devices burning highly-chlorinated wastes without adequate emission controls (or without sufficient removal by industrial furnace process chemistry) could result in ground level concentrations of HC1 that exceed reference air concentrations considered to be acceptable targets for regulatory purposes.

Part Two: Major Regulatory Approaches

We discuss in this part of the preamble why we are proposing to base permit requirements on national performance standards with provision for risk-based variances, rather than solely on site-specific risk assessments for every facility. We also explain here why the proposed rules would apply to the burning of hazardous waste in boilers and industrial furnaces irrespective of the heating value of the waste. This is significant because current regulations subject the burning of low heating value waste in boilers and industrial furnaces to the standards for incinerators in Subpart O of Parts 264 or 265.

I. Use of National Performance Standards with Risk-Based Options Versus Case-by-Case Risk Assessment for All Facilities

Under today's proposed rule, permit requirements for owners and operators of boilers and industrial furnaces would be established as necessary to ensure conformance with national performance standards for the destruction of organic compounds and emissions of metals and hydrogen chloride. The Agency has used risk assessments of reasonable, worst-case scenarios to develop the standards and to show that the standards are protective (i.e., the metals and HC1 standards are entirely risk-based and the technology-based DRE standard for organic compounds has been shown by risk assessment to be protective in most cases).

National performance standards, by design, can be conservative and may tend to overregulate many facilities. Today's rule would also provide a waiver of the national performance standard based on site-specific risk assessments. The destruction and removal efficiency (DRE) and flue gas carbon monoxide standards that control emissions of organic compounds would be waived for low risk waste. Under the waiver, the owner or operator must demonstrate by projecting emission rates and dispersion modeling that, absent controls, emissions of organic compounds would not result in ground level concentrations that pose adverse health effects. The metals and hydrogen chloride (HC1) emissions limits would also be waived for owners and operators that demonstrate by dispersion modeling that reference air concentrations for the metals and HC1 would not be exceeded. Finally, today's proposal uses risk assessment to show that the exemption of small quantity burners is not likely to pose significant risk.

Although the Agency proposes to rely heavily on the use of risk assessment to develop, support, and implement the rule, we are not proposing to use case-by-case risk assessments as the sole basis to determine Permit requirements for every facility for the reasons discussed below.

National performance standards that are based on the risk posed by reasonable, worst-case scenarios (or that are technology-based and shown to be protective under reasonable, worst-case scenarios) allow permitting officials and the applicant to avoid the cost and time required for emissions testing requisite for a site-specific risk assessment. The national performance standards proposed today ensure the cost-effective control of emissions by: (1) Waiving emissions testing for organic compounds, metals, and HC1 for boilers operating under special operating requirements; (2) waiving emissions testing for metals and HC1 for boilers and industrial furnaces burning waste with metals and chlorine levels within specification levels or waste with metals and chlorine levels such that the mass feed rate of metals and chlorine from all fuels and industrial furnace feedstocks will not result in an exceedance of the metals or HC1 emission limits, assuming all metals are emitted (e.g., no emission controls) and all chlorine is emitted as HC1; and (3) exempting burners of small quantities of waste from virtually all requirements. We estimate that small quantity burners burn less than one percent of the hazardous waste being burned as fuel.

Using national performance standards is also more cost-effective than site-specific risk assessments to establish permit conditions even when emissions testing is required because it avoids the added time and cost of dispersion modeling and estimating health effects from resulting exposures.

Not only do national performance standards allow for cost-effective variances and exemptions, but a site-specific, risk-based permitting approach to control organic emissions would be impractical given the state-of-the-art of human health and environmental effects assessments and sampling and analysis techniques for organic compounds that may be emitted. We simply do not have at this time the tools to characterize fully the emissions from combustion sources (e.g., incinerators, boilers, automobiles) and the health and environmental effects data to assess their impacts. For example, we are able today to estimate human health effects for only about 150 of over 400 compounds identified in Appendix VIII as toxic constituents of hazardous waste. Further, the types of organic compounds that can be synthesized in an improperly-operated combustion device are not limited to the Appendix VIII list. Thus, the technology-based DRE standard is needed to ensure a high level of destruction that reasonable, worst-case risk assessment has shown to be protective.[9]

In addition, even if the analytical and health effects tools were in place to consider the impacts of emissions from all organic compounds, a risk assessment that supported the use of a lower DRE (e.g., 99.9% or 99.95%) may not be of value to the regulated community. The 99.99% DRE standard and the carbon monoxide limits proposed today can be met readily. These standards would ensure that boilers and industrial furnaces operate at high combustion efficiency, which is an efficient, economical operating practice for most devices.[10] Further, to ensure that a sufficient degree of destruction is achieved above the bare-bones 99% DRE, which is assumed for the low risk waste exemption (see Section III.D of Part Three), continuous monitoring of carbon monoxide and oxygen would probably be required (albeit the limits would not be as stringent as those proposed today). Thus, even if a risk assessment approach were workable for all organic wastes, it may not prove to be cost-effective to the regulated community.

It should be noted that the proposed site-specific, risk-based waivers for metals, HC1, and low risk waste are based on an emissions dispersion analysis under several conservative assumptions. The analysis does not consider issues such as the following that would result in a less conservative analysis: (1) Current and future population exposure; (2) less than lifetime exposure to carcinogens; (3) whether the site of maximum ground level concentration is habitable; (4) total cancer incidents resulting from exposure; and (5) microenvironmental or multimedia exposure (e.g. outdoor versus indoor air). Addressing these complex issues in the context of public hearings would be difficult, expensive, and time-consuming. Accordingly, the "risk analyses" and the risk-based standards described in today's proposed rule are based on the following conservative assumptions: (1) The point of maximum annual average ground level concentration of an emission is used to access potential health impact, irrespective of whether a person resides at that point of maximum exposure today; (2) a 70 year lifetime exposure to that maximum concentration[11]; and (3) indoor air contains the equivalent concentrations of pollutants as outdoor air.

II. Regulation of Burning for Either Energy Recovery or Destruction

Today's proposed rules would regulate the burning of hazardous waste in boilers and industrial furnaces irrespective of the heating value of the hazardous waste. This proposed rule would, therefore, supersede the Agency's current policy of regulating the burning of low heating value wastes in these devices as incineration, subject to the applicable hazardous waste incinerator standards of Subpart O of Parts 264 or 265.

As discussed in Section III of Part One, EPA's May 19, 1980, rules regulate the incineration of hazardous waste but exempt the burning of hazardous waste for energy recovery. To ensure that hazardous waste typically destined for incineration because of its low heating value is not burned in a boiler or industrial furnace, ostensibly for energy recovery but actually to avoid the cost of incineration, the Agency developed a sham recycling policy. The policy was published in the March 16, 1983, **Federal Register** and states that EPA considers any hazardous waste that has less than 5,000 to 8,000 Btu/lb heating value, as generated, to have minimal heating value relative to commercial fuels. Thus, when such low heating value waste is burned in any enclosed device using controlled flame combustion—including boilers and industrial furnaces—it is considered to be incinerated and the device is subject to regulation under the incinerator standards of Subpart O of Parts 264 or 265. This is the case irrespective of whether the low heating value waste is mixed with higher heating value waste or virgin fuels such that the mixture has substantial heating value (i.e., greater than 5,000 to 8,000 Btu/lb).

Now that EPA is prepared to propose controls for boilers and industrial furnaces burning hazardous waste, we believe these proposed controls should apply irrespective of the purpose of such burning. Normally, the purpose for which a material is burned makes no difference in environmental effect. Accordingly, today's proposed rules are designed to be protective irrespective of the heating value of the hazardous waste.

III. Regulation of Burning Solely for Materials Recovery in an Industrial Furnace

Today's rule also proposes to regulate hazardous waste burned in industrial furnaces for the sole purpose of material recovery (i.e., reclamation).[12] This requires the Agency to define more precisely the circumstances when secondary materials reclaimed in industrial furnaces (i.e., burned in industrial furnaces for the sole purpose of material recovery) are solid and hazardous wastes.

Under current regulations, hazardous spent materials, listed sludges, and listed by-products are hazardous wastes when reclaimed. See § 261.2(c)(3). As EPA has explained in a number of **Federal Register** notices, however, these materials may *cease* being solid wastes at the point of burning for material recovery in industrial furnaces depending on the type of secondary material involved. See 50 FR 630–1

[9] We note that the proposed waiver of the DRE standard (and CO limits) for low risk waste is only applicable to wastes containing Appendix VIII constituents for which the Agency has established reference air concentrations (for threshold compounds) or unit risk estimates (for carcinogens). Further, the waiver provision requires a conservative estimate of health effects resulting from emissions of products of incomplete combustion (PICs).

[10] Those few boilers already operating with sophisticated combustion controls may have to operate at lower boiler (i.e., thermal) efficiency to operate at the higher combustion efficiency required by the proposed carbon monoxide limits. Fuel cost for these boilers may increase somewhat because of these regulations.

[11] Except that the 3-minute maximum average ground level concentration is used to access health effects from exposure to HC1.

[12] EPA has explained (50 FR 49167) that a hazardous waste is subject to regulation when burned in an industrial furnace for both energy recovery and some other purpose, e.g., for materials recovery. The issue here is that EPA is proposing to regulate burning *solely* for materials recovery.

(January 4, 1985) and 50 FR 49167 (November 29, 1985). The reason for this distinction is that regulation of the act of burning in an industrial furnace could lead, in some cases, to an impermissible intrusion into the production process and so be beyond EPA's authority under RCRA. *Id.*

To date, EPA has indicated that burning for material recovery of secondary materials is "indigenous" to the process in which the industrial furnace is used and is beyond the Agency's RCRA jurisdiction. Burning of "non indigenous" wastes remains within RCRA authority. *Id.*

EPA has suggested that indigenous secondary materials are those generated by the process in which the industrial furnace is normally used, and also might include secondary materials containing the same types and concentrations of Appendix VIII constituents as the raw materials normally burned in the industrial furnace. *Id.* EPA is proposing in today's rules that only materials generated by a process *using the same type of industrial furnace* as that in which burning occurs will be considered to be indigenous, and so are outside the Agency's authority when burned (subject to one exception for secondary materials burned in secondary smelting furnaces discussed below). Thus, by way of example, if a primary lead smelter were to burn a listed waste generated by another smelting process (for example, primary zinc), the material would be considered to be indigenous to smelting furnaces and hence not a solid waste at the point of burning.

EPA is proposing this approach for several reasons. First, deferring regulation could create a regulatory loophole whereby clearly nonindigenous wastes are burned outside the RCRA framework. Examples are listed electroplating wastes being burned in smelting furnaces. These electroplating wastes come from processes unrelated to smelting, and may contain different types of hazardous constituents (for example, cyanides and hexavalent chromium) or the same constituents at higher concentrations than those normally found in virgin materials normally burned in the smelting furnace (and so in many cases would not be addressed or contemplated in Clean Air Act regulations applicable to those furnaces).

Second, establishing rules relating to RCRA jurisdiction (i.e., defining "solid waste") has proven to be a difficult task. Therefore, where possible, EPA will attempt to indicate jurisdictional limits unambiguously. EPA believes that limiting jurisdiction over this type of burning to wastes generated by different types of furnaces is a clear test. These wastes will all be manifested to the burning site, and so either the origin of the waste will be known from the manifest description, or at least the manifest will state who the generator of the waste is, and hence allow easy identification of the origin of the waste. A more sophisticated test, such as requiring comparison of Appendix VIII constituents in customary virgin materials and in the waste to be burned, appears to the Agency to be overly cumbersome to administer. (As stated below, however, the EPA is specifically soliciting comment on this alternative.)

Finally, EPA believes that the types of wastes that are nonindigenous under this approach are those most likely to pose environmental threats by virtue of being different from the type of material normally burned in the industrial furnace. The electroplating wastes mentioned above are an example. For the same reason, these wastes are the ones most likely to be unrelated to materials normally burned, and so the least likely to raise jurisdictional issues relating to interference with normal production.

As noted earlier, a further requirement of the jurisdictional test is needed for secondary smelting furnaces. These industrial furnaces burn not only waste generated by other industrial furnaces, but other types of wastes such as scrap metal or battery plates as well. These materials are indigenous to secondary smelting processes: they are in fact the principal feed material to secondary smelting processes. The proposed rule consequently indicates that secondary smelting furnaces burn indigenous materials not only when they burn materials generated by smelting furnaces, but also when they burn scrap metal and (for secondary lead smelters) battery plates.

EPA anticipates the impact of this proposal to be minimal. This is because the Agency is aware of very few types of industrial furnaces that burn non-indigenous hazardous wastes exclusively for material recovery. For example, kilns normally burn hazardous wastes for a dual purpose, as do coke ovens and blast furnaces. In fact, the only type of furnaces we have identified that engage in exclusive reclamation of non-indigenous wastes are smelting furnaces burning electroplating wastes, a situation seemingly deserving of regulatory control. However, the Agency explicitly solicits comment on whether there are other operations that involve burning of hazardous waste solely for material recovery in an industrial furnace—including information on the types and numbers of facilities, quantities and types of wastes burned, and combustion and emission control practices.

The Agency also solicits comment on alternative jurisdictional approaches here. One alternative is to state that materials are indigenous only if generated by the same type of process as that in which the industrial furnace is used (rather than the same type of furnace). For example, a primary lead smelter burning secondary materials from primary lead smelting would not be considered to be burning wastes: a primary smelter burning secondary materials from primary zinc production could be considered to be burning wastes. A second alternative would involve comparing concentrations of metal to be recovered and of Appendix VIII constituents in the virgin material feed and the secondary material feed to an industrial furnace. We request commenters addressing these alternatives to present data showing these types of comparisons. Another possibility is to combine inquiry into the waste with a test based on whether the material being burned is being bought or if the furnace operator is paid to burn it.

The following examples illustrate how today's proposal would operate. (The examples assume that wastes from primary smelting can be Subtitle C hazardous wastes.)

1. A primary lead smelter receives an unlisted by-product from primary zinc production which it smelts to recover contained metal values.

The by-product is not a solid waste either before or during burning. Unlisted by-products are not solid wastes when reclaimed.

2. A primary lead smelter burns a metal bearing hazardous solvent as a partial energy source.

The solvent is a hazardous waste and the burning is within the Agency's jurisdiction. This situation involves burning wastes as fuel, not for exclusive material recovery. Industrial furnaces burning hazardous wastes solely or partially for energy recovery are within the Agency's RCRA jurisdiction. 50 FR at 49171 (November 29, 1985).

3. An incinerator (i.e., an enclosed device using controlled flame combustion that is not a boiler and is not designated as an industrial furnace in § 260.10) burns an unlisted hazardous by-product to recover contained metals.

The by-product is a hazardous waste and the incinerator is subject to the existing regulatory standards in subpart O of Parts 264 and 265. Incinerators are always deemed to incinerate and not to recycle. 50 FR 625/3 (January 4, 1985):

§§ 261.2(b)(2), 264.340(a)(1), and 265.340(a)(1).

4. A primary lead smelter receives a listed by-product from a different primary lead smelter and resmelts it.

The listed by-product ceases to be a waste when it is burned, but is a hazardous waste up until that point. Thus, it must be manifested to the smelter and must be stored in accordance with RCRA standards (including permit standards). The resmelting activity is beyond the Agency's RCRA jurisdiction. Since the material, when burned, is not a hazardous waste, the derived-from rule (§ 261.3(c)(2)(i)) would not apply to the residue from burning. 50 FR 49167 n.4 (November 29, 1985).

5. A primary lead smelter receives a listed waste from a nonsmelting process for metals recovery and resmelts it.

The material is a hazardous waste throughout burning as well as before burning. The burning consequently is controlled by today's proposed rules.

6. A primary lead smelter receives a hazardous waste from another smelting process which it burns in order to destroy contained contaminants.

The material being burned is a hazardous waste and the burning is regulated as incineration under subpart O because the waste is being burned in order to destroy it. §§ 264.340(a)(2), 265.340(a)(2).

7. A primary lead smelter generates an emission control dust which it resmelts.

The emission control dust is not a solid waste because such continuous in-house activities are defined as closed loop reclamation and are excluded from the regulatory definition of solid waste. § 261.2(e)(1)(iii).

Part Three: Discussion of Proposed Controls

I. Overview

Today's proposed rule would establish national performance standards to control stack emissions of organic compounds, metals, and hydrogen chloride (HCl) from boilers and industrial furnaces burning hazardous waste. The rule would also apply to these facilities the general standards applicable to all hazardous waste treatment, storage, and disposal facilities (e.g., closure requirements, financial requirements, preparedness and prevention requirements).

Emissions of organic compounds would be controlled by a percent reduction standard for organic constituents in the waste. A destruction and removal efficiency (DRE) for principal organic hazardous constituents (POHCs) of 99.99% would be required for all wastes except that a 99.9999% DRE would be required for dioxin-containing listed hazardous wastes.[13] Organic emissions would also be controlled by limiting flue gas carbon monoxide levels to levels indicative of high combustion efficiency to ensure hazardous waste is not burned during upset conditions. Although the DRE performance standard is a percent reduction standard and does not directly limit the mass emission rate of unburned constituents—the emission rate increases as the feed rate increases— a risk-assessment of reasonable, worst-case scenarios shows that the standard would be protective in virtually all of the scenarios of which EPA is aware.[14]

The trial burn to demonstrate destruction and removal efficiency (DRE) would be waived for boilers operating under special operating requirements designed to ensure that the boiler achieves a minimum DRE of 99.99%.[15] In addition, both the trial burn and the carbon monoxide flue gas limits would be waived for low risk waste. Under this waiver, the applicant must demonstrate that, absent these controls, emissions from the facility would not pose significant risk to public health.

Emissions of the metals arsenic, cadmium, chromium, and lead and of hydrogen chloride (HCl) would be controlled by a risk-based, four-tiered standard. Tiers I–III are national standards back-calculated from reference air concentrations (RACs) using dispersion modeling of reasonable, worst-case facilities. (We have developed hypothetical model boilers and industrial furnaces of each type known or thought likely to burn hazardous waste and conducted dispersion modeling of scenarios considered to be reasonable worst-case relative to ambient air impacts.) Tier I is a hazardous waste specification for metals and chlorine levels. The concentration limits apply to the waste either before or after blending with other wastes or fuels (i.e., the limits can be met by blending). The limits are conservatively established assuming the device burns the hazardous waste (or blended waste) as the sole fuel, and that all metals in the waste are emitted and that all chlorine is emitted as HCl. The Tier II standards limit the total feed rates of metals and chlorine to the device, considering metals and chlorine levels and feed rates of the hazardous waste, other fuel, and industrial furnace feedstock. Thus, the Tier II standards allow a waste exceeding the Tier I metals or chlorine limits to be cofired with relatively clean fuels provided that total metals or chlorine emissions do not exceed the Tier III risk-based emission limits. Like the Tier I limits, the Tier II limits assume that all metals and chlorine are emitted (i.e., no credit is provided for emissions control equipment). The Tier III standards are emission limits for metals and HCl for which conformance is demonstrated by emissions testing. Tier IV allows emissions exceeding the Tier III limits based on site-specific dispersion modeling that demonstrates that emissions from the facility will not result in exceedances of reference air concentrations (RACs) established for lead and HCl, or an aggregate incremental risk to the maximum exposed individual (MEI) of 10^{-5} (i.e., 1 in 100,000) for the carcinogenic metals arsenic, cadmium, and chromium.

Finally, boilers and industrial furnaces burning small quantities of waste relative to the fuel requirements of the device would be exempt from virtually all requirements given that the risk posed by such burning would be insignificant.

II. Overview of EPA's Risk Assessment

The Agency has used risk assessment to: (1) Show that, absent controls, emissions of organic compounds, certain metals, and hydrogen chloride (HCl) can pose serious health effects; (2) show that the 99.99% destruction or removal efficiency (DRE) standard would be protective in virtually all scenarios of which the Agency is aware; and (3) establish risk-based emission limits for metals and HCl. The risk assessment methodology is discussed in detail in the background document supporting this proposed rule—*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.[16] The methodology is summarized below for the convenience of the reader.

The general approach involved identifying a reasonable, worst-case facility with respect to potential ambient air impacts for a boiler and each type of

[13] The following wastes are listed in 40 CRF 261.31 because they contain chlorinated dioxins and furans: EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027.

[14] EPA will provide guidance to the permit writter to identify situations where the national performance standards may not be fully protective.

[15] Boilers burning dioxin-containing listed wastes are not eligible for the trial burn waiver.

[16] The background document is available from the National Technical Information Service, Springfield, VA, Order No. PB 87 173845.

industrial furnace known or believed likely to burn hazardous waste (e.g., cement kiln, light-weight aggregate kiln, blast furnace). The identified facilities are considered to produce reasonable, worst-case ground level concentrations of pollutants when burning hazardous waste. To show that, absent regulatory controls, serious health effects could be posed by burning hazardous waste and to show that a 99.99% DRE standard is protective, we estimated emissions from the reasonable, worst-case facilities and used dispersion modeling [17] to predict ground level concentrations. For threshold (noncarcinogenic) compounds, we then compared predicted ground level concentrations to reference air concentrations (RACs). For carcinogenic compounds, we estimated the aggregate risk to a person residing for a lifetime at the point of maximum annual average ground level concentration. To develop emission limits for lead and HCl, we back- calculated from the RACs using the dispersion factors (i.e., ug/m^3 per g/s emissions) for the reasonable, worst-case facilities. Emission limits for the carcinogenic metals arsenic, cadmium, and chromium are established by an equation that relates the emission of each metal to the emission corresponding to an incremental risk of 10^{-5}. The emission corresponding to an incremental risk of 10^{-5} is established by back- calculating from the risk-specific dose (RSD) at a 10^{-5} risk level for each metal using the dispersion factors for the reasonable, worst-case facilities. The equation sums the ratios for all three metals and requires that the sum not exceed 1.0.

We describe below how we identified reasonable, worst-case facilities, how we developed the RACs, how we are addressing the risk posed by carcinogens, and the assumptions used in the risk assessment.

A. Identification of Reasonable, Worst-Case Facilities

In developing reasonable, worst-case facilities, we considered: (1) Actual boilers according to information obtained from our mail survey; (2) eight hypothetical model boilers ranging in size from 0.4 MM Btu/hr to 400 MM Btu/hr; (3) hypothetical model industrial furnaces for each type of furnace known or considered most likely to burn hazardous waste; (4) the impact of flat versus complex terrain on ambient ground level concentrations [18]; and (5) the impact of tip downwash for devices with short stacks (e.g., small boilers, asphalt plants, sulfur recovery plants).

1. *Flat terrain modeling.* To identify reasonable, worst-case facilities of each type being considered in flat terrain we identified the boiler site representing the 95th percentile worst meteorological situation with respect to potential ambient air impacts. This site was identified assuming that a given stack with fixed release properties (i.e., factors that affect effective stack height such as stack height and stack gas flow rate and temperature) was located at each of the 114 facility sites identified by the mail questionnaire survey. Each site was then modeled using ISCLT and the site having the 95th percentile worst dispersion factor (ug/m^3 round level concentration per 1 g/s emission rate) was selected as the reasonable, worst-case site.

The reasonable, worst-case facility of each type under consideration was then identified by: (1) for boilers, modeling the actual boiler and the model boiler with the greatest potential for adverse ambient impacts (considering capacity and stack height) at the reasonable, worst-case site (using ISCLT) and identifying which boiler had the greatest potential adverse impact on ground level concentrations of pollutants; and (2) for industrial furnaces, locating each model furnace at the reasonable, worst-case site. Devices with short stacks where tip downwash could cause high ground level concentrations close to the stack were modeled assuming that a relatively large building was located adjacent to the stack.

Devices that had approximately the same potential ambient air impacts were then grouped together in categories. One set of categories is based on maximum annual average concentrations, and another set is based on maximum 3-minute concentrations (for HCl). The Tier I–III metals and HCl standards discussed below were then established for each category. The device type within each category that posed the greatest potential adverse air impacts was used to establish the limits for that category.

2. *Complex terrain modeling.* Of the 114 sites identified in the mail questionnaire survey, we determined that 68 were located in areas where the surrounding terrain within 20 kilometers of the stack exceeded the stack height, and were, therefore, considered to be in complex terrain. (Ground level concentrations can be much higher in complex terrain than in flat terrain because receptors can be elevated by the terrain to levels closer to the centerline of the stack emissions plume.) Thus, standards for facilities in complex terrain were developed to address the hazard posed to receptors elevated by terrain.

To identify reasonable, worst-case facilities in complex terrain, we ranked the 114 boiler facilities by potential to cause high ground level concentrations (irrespective of topography or meteorological conditions) by using an index that considered facility capacity (MM Btu/hr heat input) and stack height. We then identified the seven boiler sites with the greatest potential for high ambient concentrations that were also located in complex terrain (i.e., terrain within 20 kilometers of the stack exceeded the stack height). At each of these seven sites, we used the LONGZ and SHORTZ models to predict maximum annual average and maximum 3-minute concentrations to model: (1) The actual boiler located at the site; (2) the model boiler with the greatest potential for adverse ambient impacts (considering capacity and stack height); and (3) each model furnace.

The reasonable, worst-case facility for each type of device was then identified as the site associated with the highest ground level concentrations.

As with the flat terrain analysis, devices having approximately the same potential ambient air impacts were grouped together in categories. One set of categories was developed for maximum annual average concentrations and another set for maximum 3-minute concentrations. Tier I–III standards were developed for each category and the device within each

[17] The ISCLT (Industrial Source Complex, Long Term) model was used to predict maximum annual average ground level concentrations for flat terrain. The ISCST model was used to predict maximum 3-minute concentrations for HCl in flat terrain. In addition, the OAQPS Guideline Models LONGZ and SHORTZ were used for complex modeling for the selected worst-case sites in complex terrain to predict maximum annual average and maximum 3-minute concentrations. Maximum quarterly average concentrations for lead were computed from the maximum annual average concentrations by multiplying by a factor of 1.6, which represents a typical ratio of maximum quarterly to maximum annual average concentrations.

[18] We note that we have established the Tier I–III standards for metals and HCl for two topographic regimes: flat and complex terrain. EPA has defined an intermediate terrain, however, that is noncomplex and nonflat (i.e., rolling). EPA has recommended dispersion medels to address such terrain. Unless the plume from a source drops to ground level a short distance from the stack because of, for example, tip downwash, maximum ground level concentrations would be expected to increase as a given source were moved from flat terrain to nonflat, noncomplex terrain and, finally, to complex terrain. Given that the flat terrain standards proposed today may not be protective for nonflat, noncomplex terrain (and that flat terrain standards would apply to facilities not located in complex terrain), EPA is considering developing standards for the final rule for the third type of terrain: nonflat, noncomplex. EPA specifically requests comments on this issue.

category that posed the greatest potential adverse air impacts was used to establish the limits for that category.

We estimate that approximately 15–20 percent of the facilities burning hazardous wastes are located in terrain which will require that the facilities meet the complex terrain limits.

B. Reference Air Concentrations for Systemic Toxicants

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 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 exposure levels from exceeding the threshold dose, or the "reference air concentration."

Reference air concentrations (RACs) have been derived from oral RfDs for those threshold compounds listed in Appendix VIII of 40 CFR Part 261 for which the Agency has adequate health effects data (see Appendix A of this preamble). These oral-based RACs are subject to change, and RACs for additional compounds are likely to be developed in the near future given that the Agency has recently established an internal workgroup (the Inhalation RfD Workgroup) to develop inhalation reference doses for use in Agency programs. That workgroup is expected to develop a methodology and inhalation references doses for a number of chemicals by late 1987. In the interest of time, the Agency has decided to propose the oral-based RACs for purposes of today's rule rather than to wait until the internal workgroup completes its efforts.

The Agency's reasoning for proposing RAC's derived from oral RfDs is as follows:

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 reasoning for these decisions are publicly available.

2. The verification process assures that the critical study is of appropriate length and quality to derive a health limit for long-term, life-term protection.

3. RfDs are based on the best available information that meet minimum scientific criteria and may come from experimental animal studies or human studies.

4. RfDs are designed to give long-term protection for all members of the population, including persons uniquely at risk, such as pregnant women, growing 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 and the amount of the supporting data. The criteria for the confidence rating is discussed in the RfD decision.

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, the inhalation exposure limit will be calculated 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 there exists appropriate EPA health documents, such as the Health Effects Assessments (HEAs) and the Health Effects and Environmental Profiles (HEEPs), containing relevant inhalation toxicity data, the data will be used in deriving an inhalation exposure limit. Other agency health documents (e.g., NIOSH's criteria documents) will also be considered.

4. If RfDs or other toxicity data from agency health documents are not available, then other sources of toxicity information will be considered. The calculation will be 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 upon dosimetry. The Agency, through its Inhalation RfD Workgroup, is developing reference dose values for inhalation exposure, and many are expected to be available this year. The Agency will use the available inhalation RfDs when this rule is promulgated. If, however, the workgroup develops inhalation reference doses prior to promulgation of today's rule that are substantially different from the RAC's 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.**

As previously stated, the RACs are derived from oral Reference Doses (RfDs) for the compounds. 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 during a lifetime.[19] The RfD for a specific chemical is calculated by dividing the experimentally-determined no-observed-adverse-effect-level by the appropriate uncertainty factor(s).

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

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

where:

- RfD is the oral reference dose
- Body weight 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/day
- Correction factor for route-to-route extrapolation (going from the oral route to the inhalation route) is 1.0
- Factor to apportion the RfD to the intake resulting from direct inhalation of the compound emitted from the source is 0.25 (i.e., an individual is assumed to be exposed to 75% of the RfD from the combination of other sources).

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, adverse health effects are not anticipated. 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 1-minute or 15-minute period of exposure than the maximum annual average exposure. This is because, during the annual exposure, the periods of exposure to high concentrations are balanced by periods of exposure to low concentrations as wind speed and direction varies. Thus, maximum annual average concentrations are always

[19] 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).

much lower than short-term exposure concentrations. On the other hand, the short-term exposure RAC is also generally much higher than the life-time 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 since no acceptable methodology exists for the derivation of less than life-time exposures from RfDs.[20] However, despite this limitation, we are proposing a short-term (i.e., 3-minute) RAC for HCl of 150 mg/m^3 based on limited data documenting a no-observed-effect-level in animals exposed to HC1 via inhalation.[21] We do anticipate, however, that short-term RACs for other compounds will be developed by the Agency.

C. Risk From Carcinogens

EPA policy suggests that no threshold dose can be demonstrated experimentally for carcinogens. This leads to the assumption that an exposure theoretically would represent some finite level of risk for carcinogens. EPA's Carcinogen Assessment Group (CAG) has estimated the carcinogenic potency for humans exposed to low dose levels of carcinogens (both known and suspected human carcinogens). The potency factors have been used to estimate the unit risk of carcinogenic constituents on Appendix VIII. The unit risk is the incremental risk to an individual exposed for a life-time to ambient air containing one microgram of the compound per cubic meter of air. We have used the available unit risk values to calculate risk-specific doses (RSDs) for an incremental risk of 10^{-5} (i.e., 1 in 100,000). See Appendix B of this preamble.

For purposes of this regulation, the Agency is proposing that an incremental lifetime risk to the most exposed individual (MEI) of 1×10^{-5} (1 in 100,000) is a reasonable risk. Accordingly, the risk based standards proposed today ensure that the incremental risk from direct inhalation of carcinogenic stack emissions does not exceed 1×10^{-5}. The risks from the individual carcinogens are summed to develop an aggregate MEI risk. Thus, the aggregate risk to the MEI is calculated by predicting the maximum annual average ground level concentration for each carcinogenic emission, calculating the ratio of that concentration to the RSD (See Appendix B), and summing the ratios for all carcinogenic compounds. The sum cannot exceed 1 in order for the risk not to exceed 1×10^{-5}.[22]

We are proposing that a 1×10^{-5} lifetime incremental risk level is reasonable for this regulation because the MEI risk posed by coal and oil-fired boilers is generally in the range of 1×10^{-5}.[23]

The Agency specifically requests comment on whether aggregate population risk or cancer incidence (i.e., cancer incidents/year) should also be considered in developing the national emission limits and in the site-specific risk assessments under the various waivers proposed. Thus, both the risk to the MEI and increased cancer incidence could be considered. This approach could 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. An incremental cancer incidence in the range of 0.1 to 0.5 cancers per year could be considered significant. Based on public comment and further thought on how to implement this dual approach (i.e., considering both MEI risk and cancer incidence), the final rule could incorporate both approaches. Alternatively, EPA may 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) of HSWA.

D. Assumptions Used in the Risk Assessment

A number of assumptions, some conservative and others nonconservative, have been used in the risk assessment 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 maximum short-term ground level concentration (for HCl). Further, the risk estimates for carcinogens assume the individual resides at the point of maximum annual average concentration for a 70 year lifetime.
- Indoor air contains the same levels of pollutants as outdoor air.
- For noncarcinogenic health determinations, background exposure already amounts to 75% of the RfD. This includes other routes of exposure including ingestion and dermal. Thus, the boiler or industrial furnace is only allowed to contribute 25% of the RfD via direct inhalation. The only exception is lead where the allowed contribution is 10% of the NAAQS. We are allowing a lower contribution for lead 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 the health risks from lead in light of health effects data available since the NAAQS was established. The Agency is currently reviewing the lead NAAQS to determine if it should be lowered.

Note.—We have not attempted to quantify indirect exposure through the food chain, ingestion of water contaminated by deposition, and dermal exposure because the methodology has not yet been developed and approved for use in assessing risk from combustion sources. We note, however, that allowing the source to contribute only 25% of the RfD accounts for indirect exposure by assuming a person is exposed to 75% of the RfD from other sources and other exposure pathways. (The Agency has developed such a methodology for application to waste combustion sources and the Agency's Science Advisory Board has reviewed this methodology. Assuming Agency-wide procedures are developed, a more detailed analysis may be applied to boilers and furnaces burning hazardous wastes.)

- Risks are considered both for pollutants that are known human carcinogens and those that are known animal carcinogens and therefore, are suspected human carcinogens.

Nonconservative assumptions include the following:

[20] Memo from Clara Chow thru 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.

[21] Memo from Characterization and Assessment Division to Waste Management Division, October 2, 1986, interpreting results from Kirsch, V.H.; Drabke P. (1982). *Assessing the Biological Effects of Hydrogen Chloride.* Z. Gesamte Hyg. Ihre. Grenzgeb. 28:107–109.

[22] We note that the ground level concentrations of interest are the *off-site* concentrations. The risk posed by emissions on-site are more appropriately addressed as an occupational hazard by the Occupational Safety and Health Administration. Thus the Tier IV and low risk waste risk assessments are based on off-site ambient concentrations. EPA specifically requests comments, however, on whether on-site concentrations should be considered for facilities where people reside on-site (e.g., military bases, colleges and universities). (The Tier I–III standards are conservatively based on dispersion modeling that did not consider whether the maximum concentrations were located on-site or off-site.) We note further that the MEI concentration used for this regulation is more correctly the potential MEI concentration in that it represents the maximum annual average ground level concentration irrespective of whether a person actually resides at that location.

[23] Office of Air Quality Planning and Standards, EPA, *Coal and Oil Combustion Study. Summary and Results*, September 1986 Draft Report.

• Although emissions are complex mixtures, additive effects of threshold compounds and interactive effects of threshold or carcinogenic compounds have not been considered given the lack of information.

Note.—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).

• Ecological effects (i.e., effects on plants and animals) have not been considered given the lack of information. Adverse effects on plants and animals may occur at doses lower than the levels that cause adverse effects in humans. (The Agency is also developing procedures and requesting Science Advisory Board review to consider ecological effects resulting from emissions from waste combustion facilities.)

III. Proposed Controls for Emissions of Toxic Organic Compounds

A. Hazard Posed by Combustion of Toxic Organic Compounds

The burning of hazardous waste containing toxic organic compounds (i.e., organic compounds listed in Appendix VIII of 40 CFR Part 261) under poor combustion conditions can result in substantial emissions of the original compounds which were not burned and compounds that result from the partial but incomplete combustion of constituents in the waste. The quantity of toxic organic compounds emitted depends on the concentration of the compounds in the waste, the waste firing rate (i.e., the percentage of total boiler or industrial furnace fuel provided by the hazardous waste), and the combustion conditions under which the waste is burned. The risk posed by the emissions depends on the toxicity of the compounds emitted, and the ambient levels to which persons are exposed. Hypothetical risk assessments show that under poor combustion conditions that achieve only 99 percent or 99.9 percent destruction efficiency of organic compounds, risks to the maximum exposed individual from unburned carcinogenic organics found in hazardous waste can result in increased lifetime cancer risks of 10^{-4}.[24]

B. Basis for the DRE and CO Performance Standards for Toxic Organic Compounds

The Agency is proposing to control the emission of toxic organic compounds from boilers and industrial furnaces burning hazardous waste with two performance standards. A 99.99 percent destruction and removal efficiency (DRE) standard for principal organic hazardous constituents (POHCs) in the waste feed would ensure that constituents in the waste would not be emitted at levels that could pose significant risk in virtually all scenarios of which the Agency is aware.[25] In addition, flue gas carbon monoxide (CO) levels would be limited to ensure the device operates continuously at high combustion efficiency. Thus, when burning hazardous waste, these devices cannot operate under upset conditions, which could lead to significant emissions of products of incomplete combustion (PICs), typically evidenced by smoke emissions. The basis for these standards is discussed below.

1. *Results of Emissions Testing.* The Agency conducted field tests on 11 full-scale industrial boilers and 12 industrial furnaces. The test results indicate that:

• Boilers and industrial furnaces can be operated to achieve 99.99 percent DRE of POHCs considered difficult to destroy— carbon tetrachloride, chlorobenzene, trichloroethylene, and tetrachloroethylene.

• Boilers cofiring hazardous waste fuels with fossil fuels where the hazardous waste provides less than 50 percent of the boiler's fuel requirements can achieve 99.99 percent DRE of POHCs under a wide range of operating conditions (e.g., load changes, waste feed rate changes, excess air rate changes).

• When boilers and industrial furnaces are operated at high combustion efficiency, as evidenced by flue gas carbon monoxide (CO) levels of less than 100 ppm, DREs exceed 99.99 percent. Although the tests showed this relationship between CO and DRE, there was no direct correlation between CO (an indicator of combustion efficiency) and DRE. Devices clearly operating under poor combustion conditions, as evidenced, for example, by smoke emissions, still achieved 99.99 percent DRE. It appears that POHCs are immediately destroyed in the flame zone.

• Emissions of products of incomplete combustion (PICs) (i.e., quantitated Appendix VIII pollutants that are not POHCs) generally ranged from 0.5 to 5 times POHC emission rates.

• Emissions of PICs appeared generally to increase as combustion efficiency decreased as evidenced by increased flue gas CO levels.

• Emission of total unburned hydrocarbons (i.e., quantified Appendix VIII pollutants as well as unburned POHCs and other unburned organic compounds) clearly increase as combustion efficiency decreases as evidenced by an increase in flue gas CO levels.

2. *Overview of test program.* The boiler testing program had two primary purposes: (1) To determine if boilers operated under steady-state conditions to achieve maximum combustion efficiency could achieve 99.99 percent destruction and removal efficiency (DRE) of principal organic hazardous constituents (POHCs) in the waste: and (2) to determine how changes in operating conditions (e.g., waste firing rates, boiler load, excess flue gas oxygen levels) would affect the boiler's ability to achieve 99.99 percent DRE of POHCs—so-called nonsteady-state testing.

To meet the first objective (steady-state testing), EPA tested ten boilers that represented a wide variety of boiler types and sizes and that burned a variety of hazardous wastes and auxiliary fuels. The boilers ranged in type and size from a small 8 million Btu/hr fire tube boiler to a 250 million Btu/hr water tube boiler. The hazardous wastes burned ranged from methanol and toluene wastes with a 18,500 Btu/lb heating value similar to that of No. 6 fuel oil (and which was spiked with chlorinated organics for test purposes) to a methyl acetate waste with a heating value of less than half that of No. 6 fuel oil (and which also was spiked with chlorinated organics for test purposes). Waste firing rates ranged from 100 percent of the boiler's fuel requirements (for a waste having a heating value of 9,000 Btu/lb and containing 43 percent chlorine, by weight) to less than 10 percent of the boiler's fuel requirements on a heat input basis. Boiler auxiliary fuels (if any) were natural gas, No. 6 fuel oil, pulverized coal, and waste wood.

EPA conducted nonsteady-state testing on three boilers, one of which was also tested under steady-state conditions. One boiler was a 140 million Btu/hr capacity water tube boiler that could cofire hazardous waste with either natural gas or No. 6 fuel oil. This boiler was cofired with a methyl methacrylate distillation bottom with a heating value of about 11,500 Btu/lb that was spiked with carbon tetrachloride and

[24] Engineering-Science, *Background Document for the Development of Regulations To Control the Burning of Hazardous Waste in Boilers and Industrial Furnaces.* Volume III, February 1987.

[25] Except that a 99.9999% DRE would be required for dioxin-containing listed waste.

monochlorobenzene in concentrations ranging from 0.4 to 4.5 percent. The second boiler was a 450 million Btu/hr capacity water tube boiler also designed to cofire hazardous waste with natural gas. This boiler typically operated at a capacity of 250 million Btu/hr and was cofired with liquid organic heavy ends from a butanol/propanol production unit. The waste had a heating value of about 12,800 Btu/lb and was spiked with up to 16 percent carbon tetrachloride, monochlorobenzene, and trichlorobenzene. The third boiler was a 170 million Btu/hr capacity water tube, stoker fired boiler designed to handle an aqueous sludge for disposal (i.e., incineration or destruction). The aqueous sludge had virtually no heating value and was fired with pressure-atomized guns into the combustion zone just above the coal grate at rates of 12 to 20% of the volume of total boiler feed (i.e., sludge plus coal fuel). The sludge was spiked with 5 to 10% trichloroethylene or trichlorobenzene as tracer compounds to determine destruction and removal efficiencies.

More than 100 individual stack emission tests were conducted to determine the effect on DRE and emissions of products of incomplete combustion (PICs) of: (1) Burning hazardous waste under conditions of high and low boiler loads, high and low excess air rates, high and low waste firing rates (up to about 50 percent of the boiler's fuel requirements), and during soot blowing: (2) burning hazardous waste while boiler load, excess air rates, and waste firing rates were changed; and (3) start-up of waste firing operations.

The following industrial furnaces were tested: five cement production kilns, both dry and wet process types: two asphalt aggregate kilns: two light-weight aggregate production kilns, a lime production kiln; and a pig iron blast furnace. The results of these tests should be indicative of the ability of industrial furnaces to burn hazardous wastes efficiently.[26] The hazardous wastes burned in these industrial furnaces during the tests ranged from used oil spiked with several thousand ppm of chlorinated solvents to hazardous waste mixtures containing halogenated and nonhalogenated solvent recovery distillation bottoms and spent solvents from manufacturing processes (e.g., paint manufacturing) where chlorine levels ranged from 1 to 5 percent. The heating value of the waste fuels ranged from 10,000 to 18,000 Btu/lb and the hazardous waste firing rate ranged from 100 percent for the asphalt aggregate kilns, light-weight aggregate kilns, and lime kiln to about 5 percent of the heat input to the blast furnace.

EPA did not conduct nonsteady-state testing of industrial furnaces to determine the range of operating conditions under which they could be expected to achieve 99.99 percent DRE. Given that there are five different categories of industrial furnaces that are burning (or have burned) hazardous waste and that some categories have substantially different types of devices (e.g., wet versus dry process cement kilns, drum mix versus batch mix asphalt operations), EPA believes that the cost of nonsteady-state testing for each type of industrial furnace would be prohibitive. Moreover, the primary purpose for the boiler nonsteady-state testing was to determine if operating conditions could be specified such that the device could be assumed to be achieving 99.99 percent DRE without the need for a trial burn to demonstrate DRE. Based on the boiler testing, EPA is proposing an automatic waiver of the trial burn for owners and operators who operate the boiler under special operating requirements. The basis for that approach is discussed in Section III.C below. EPA believes that this approach may allow many of the 900 boilers burning hazardous waste to avoid the expense of conducting trial burns. Given that EPA believes that there may be only about 50 industrial furnaces burning hazardous waste and given the cost of testing five to seven or more industrial furnaces operated under nonsteady-state conditions, EPA does not believe that such a testing program for industrial furnaces would be cost-effective. Thus, as discussed below, EPA is proposing that owners and operators of all industrial furnaces, as well as those boilers not operated under the proposed special conditions, conduct trial burns to demonstrate conformance with the DRE standard.

3. *Interpretation of test results.* The boilers tested under nonsteady-state conditions achieved 99.99 percent DRE of POHCs under nearly all operating conditions tested. It would not be appropriate, however, to assume that any boiler burning any hazardous waste fuel under any waste firing and boiler operating conditions will achieve 99.99 percent DRE. Although the nonsteady-state tests varied a number of parameters over a wide range, some parameters could not be tested at the three test sites and other parameters could not be tested over their full range. As examples, hazardous waste was not fired with nonfossil fuels like waste wood, the maximum waste firing rate tested was 56 percent on a heat input basis, the boilers were not operated at loads below about 25 percent, and excess oxygen levels in the flue gas did not exceed 10 percent. Parameters such as these can affect boiler combustion efficiency and, thus, destruction of toxic organic constituents in the hazardous waste and emissions of incompletely burned organics. (See discussion below.) Although most of the appropriate parameters were tested at the "extremes" during one or more of the 11 steady-state tests discussed above, the boilers were operated during these tests under constant conditions in an attempt to achieve peak combustion efficiency. Thus, we do not know how narrow the envelope of operating conditions may be to ensure peak combustion efficiency and 99.99 percent DRE for a boiler already operating at the "extremes" (e.g., burning hazardous waste with a heating value of 1,000–8,000 Btu/lb as primary fuel; burning 100 percent hazardous waste with a heating value of less than 9,000 Btu/lb: or operating at a very low load).

4. *Basis for the DRE standard.* EPA is proposing a 99.99 percent DRE performance standard for POHCs [27] because it is protective, it can be readily achieved by boilers and industrial furnaces as discussed above, and it would ensure that the Agency's controls are consistent for all combustion devices—boilers, industrial furnaces, and incinerators— that pose similar risks.

Hypothetical risk assessments have shown that a 99.99 percent DRE standard for POHCs is protective in virtually every scenario of which the

[26] The only other industrial furnaces known to burn hazardous waste as fuel (or to have been tested at full scale) are sulfur recovery furnaces and halogen acid furnaces. Although EPA has not conducted emissions testing of a sulfur recovery furnace and has tested only one type of halogen acid furnace (a hydrogen chloride production furnace), the Agency believes such furnaces should be able to comply with the standards proposed today and, thus, could safely burn hazardous waste. The Agency, however, specifically requests information on sulfur recovery furnaces, halogen acid furnaces, and other industrial furnaces that burn hazardous waste, including the types and quantities of wastes burned. The Agency also requests comments on whether the proposed standards would be protective for industrial furnaces not explicitly identified in proposed §§ 266.34–4 (b) and (c).

[27] Except that, as required for incinerators, a 99.99 percent DRE would be required for the dioxin-containing wastes: EPA Hazardous Wastes F020, F021, F022, F023, F026, and F027. See § 264.343(a)(2).

Agency is aware.[28] Increased lifetime cancer risks to the maximum exposed individual would generally be 10 or less. Threshold (i.e., noncarcinogenic) organic compounds as well would not be expected in hazardous waste burned in these devices at levels that could pose a health hazard under the 99.99 percent DRE standard.

It should be noted, however, that the DRE standard does not directly control the mass emission rate (e.g., pounds per hour) of unburned POHC. Although there could be hypothetical situations where risks from POHCs could be significant under a 99.99 percent DRE standard (e.g., boilers or industrial furnaces located in urban areas burning high volumes of waste with high concentrations of highly potent carcinogenic organics), the Agency is not aware of any such situations. (See Section I of Part Two of this preamble.) If, however, during the permit process, it appears that high risk scenarios exist, permit officials can use the omnibus provision of Section 3005(c) of HSWA to develop permit requirements, as necessary, to protect human health and the environment (e.g., by requiring a 99.9999 percent DRE, by limiting the feed rate of particularly toxic compounds, or by setting a mass emission rate).

EPA specifically requests comments on using surrogate compounds in lieu of POHCs (actual constituents in the waste) to demonstrate DRE during a trial burn. To be useful as universal surrogates, such compounds must be more difficult to destroy than any principal organic constituent in the waste. Thus, the surrogates should have a low heat of combustion (e.g., carbon tetrachloride), the conventional index for predicting incinerability. In addition, in light of work conducted by the University of Dayton Research Institute,[29] the surrogates should also have a high gas phase thermal stability under low oxygen conditions (e.g., monochlorobenzene, trichloroethylene). Further, the surrogates need not be limited to toxic compounds listing in Appendix VIII of Part 261. Other compounds, notably SF_6, appear to have very high thermal stability and may be useful as a universal surrogate.[30] To be conservative, it appears appropriate to select several compounds as surrogates—one or two compounds that have low heat of combustion, and one or two compounds that have high thermal stability. Such compounds could be used as a universal mixture of surrogates, or "POHC soup". EPA specifically requests comments on this approach to simplify and standardize DRE testing.

5. *Basis for the CO standard.* EPA is proposing to limit flue gas carbon monoxide (CO) levels to ensure that boilers and industrial furnaces are operated at high combustion efficiency when burning hazardous waste. Thus, emissions of incompletely burned organic compounds are expected to be minimized to levels that would not pose significant risk.

a. *PIC Emissions.* EPA evaluated emissions of products of incomplete combustion (PICs) by quantifying emissions of priority pollutants that were not constituents in the waste (and evaluated as POHCs). PIC emission rates varied from about 0.1 to over 100 times POHC emission rates, but generally ranged from 0.5 to 5 times POHC emission rates. Semivolatile PIC emissions were nearly always insignificant compared to the levels of volatile PICs. Thus, large molecular weight (semivolatile) compounds apparently were not being synthesized. (We note, however, that laboratory studies have shown that single chlorinated organic compounds can produce several chlorinated PICs. These PICs were not limited to simple fragments of the parent POHC but included higher order chlorinated organics.)

Typical chlorinated PICs found during the full scale boiler testing included chloroform, trichloroethane, tetrachloroethylene, dichloromethane, chloromethane, and carbon tetrachloride. In addition, two nonchlorinated PICs were nearly always found—benzene and toluene.

EPA also evaluated dioxin emissions from boilers cofired with hazardous waste fuel. Emission of chlorinated dioxins and chlorinated furans, their tetra, penta, hexa, hepta and octa homologs, as well as the highly toxic isomer, 2,3,7,8-TCDD were quantified during steady-state testing of five boilers.[31] Four of the boilers were oil, gas, or pulverized coal boilers typical of those that burn hazardous waste fuels. These boilers ranged in capacity from 100 to 340 MM Btu/hr and fired hazardous waste generally at rates of 20 to 47 percent of total heat input. Emissions of total PCDD (polychlorinated dibenzo-p-dioxins) ranged from less than 0.08 to 1.1 nanograms/cubic meter of flue gas (0.0048—0.066 ppt)[32] and emissions of total PCDF (polychlorinated dibenzo-furan) ranged from 0.14 to 5.5 nanograms/cubic meter (0.0084–0.33 ppt). The highly toxic isomer, 2,3,7,8-TCDD, was found in the emission from only one boiler and at a level equal to the detection limit of 0.002 nanograms/ cubic meter.

The fifth test boiler was a 100 MM Btu/hr wood-fired stoker boiler. The boiler cofired creosote sludge at a 40 percent heat input firing rate with wood chips, bark, and sawdust. As is typical of batch-feed wood-fired stokers, large and frequent fluctuations in excess air and carbon monoxide emissions were indicative of erratic combustion conditions. Emissions of total PCDD were 76 nanograms/cubic meter of flue gas (4.56 ppt). PCDF emissions were not determined. Emissions of 2,3,7,8-TCDD were not detected at a detection limit of 0.002 nanograms/cubic meter (0.00014 ppt).

We note that there is a substantial degree of uncertainty associated with quantifying the emission of unburned organics. The test results can over or underestimate the emission of unburned organics attributed to burning hazardous waste fuels. Hazardous wastes were cofired with fossil fuels during most of the test burns. Any fossil fuel PIC was included as a PIC generated by the hazardous waste. Fossil fuel combustion is known typically to generate the PICs benzene and toluene and, if the fossil fuel contains chlorine (e.g., coal), many of the hazardous waste chlorinated PICs listed above could also be generated by the fossil fuel. In addition, some of the organic compounds identified during EPA's testing as PICs may, in fact, result from contamination from sampling train absorbent, laboratory solvents, or from such sources as freon leaks from a refrigerator used to store samples prior to analysis.

PIC emissions could also be underestimated because only those organic compounds listed as toxic constituents of hazardous waste in Appendix VIII of Part 261 were quantified and designated as PICs. Although GC/MS analysis was used to

[28] Engineering Science, *Background Information Document for the Development of Regulations to Control the Burning of Hazardous Waste in Boilers and Industrial Furnaces.* Volume III, January 1987.

[29] Dr. Barry Dellinger, Michael D. Graham, and Debra A. Tiney, University of Dayton, Research Institute, "Predicting Emissions from the Thermal Processing of Hazardous Wastes", *Hazardous Waste and Hazardous Materials,* Volume 3, Number 3, 1986.

[30] Dr. Philip H. Taylor and Dr. John Chadbourne, "SF_6 as a Surrogate for Measuring Hazardous Waste Incinerator Performance", submitted for publication to Journal of Air Pollution Control Association, March 1987.

[31] Acurex Corporation, *Dioxin Emissions from Industrial Boilers Burning Hazardous Materials,* April 1985.

[32] ppt: parts per trillion.

quantify about 100 of these compounds, many other unburned organic compounds were undoubtedly emitted. Some of these compounds are undoubtedly toxic even though they are not listed in Appendix VIII.

Although additional research is needed to understand combustion reactions where organic constituents in hazardous waste are first "destroyed" and where intermediate products of combustion are formed until ultimately, and ideally, all hydrocarbons are converted to carbon dioxide and water, the available data lead the Agency to conclude: (1) the risk posed by PIC emissions is probably not significant when combustion devices achieve 99.99 percent DRE of POHCs even though they may operate at less than maximum combustion efficiency; and (2) nonetheless, given the uncertainties as to the types and quantities of PICs that may be emitted when a combustion device is not operated at high combustion efficiency, it is prudent to provide controls that ensure that boilers and industrial furnaces are operated at high combustion efficiency when burning hazardous waste. Both of these points are discussed below.

b. *Risk from PIC emissions.* As discussed above, test data indicate that PICs are generally emitted at rates of from 0.5 to 5 times the rate of POHCs. Given that the preponderence of the PICs were relatively low molecular weight, volatile compounds even when the POHCs were high molecular weight, semivolatile compounds, and, given that the carcinogenic PICs have potencies similar to the POHCs. As discussed above, the increased lifetime cancer risk from unburned POHC emissions at a 99.99 percent DRE is on the order of 10^{-6} or less. Thus, PICs emitted at a rate of 0.5 to 5 times POHC rates would increase risks by less than half an order of magnitude—to 10^{-5} or less.

Although some dioxins (e.g., 2,3,7,8-TCDD) are orders of magnitude more potent than the other PICs (and POHCs) identified during the testing program, the emission of dioxins and furans were found to be virtually insignificant. Emission rates for all dioxin and furan homologs were converted to 2,3,7,8-TCDD emissions equivalents to estimate the increased lifetime cancer risk to the maximum exposed individual under reasonable, worst case scenarios. The risk from dioxin and furan emissions appears on the order of 10^{-7}.

c. *Use of CO limits to ensure high combustion conditions.* Generally accepted combustion theory holds that low CO (carbon monoxide) flue gas levels are indicative of a boiler, industrial furnace, or incinerator operating at high combustion efficiency. Operating at high combustion efficiency conditions helps ensure minimum emissions of unburned (or incompletely burned) organics.[33] In the first stage of combustion of hazardous waste fuel, the POHCs are immediately thermally decomposed in the flame to form other, usually smaller, compounds termed PICs (products of incomplete combustion). In this first stage of combustion, these PICs are also 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 continuously being fired, both combustion stages are occurring simultaneously.

Using this view of waste combustion, the "destruction" of a POHC, and perhaps even the destruction of PICs, is independent of flue gas CO levels. Thus, CO flue gas levels cannot be correlated to DRE for POHCs and may not correlate well with PIC destruction. (As discussed above, test data show no correlation between CO and DRE, 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. In fact, that critical CO level may be dependent on site-specific and event-specific factors (e.g., fuel type, fuel mix, air to fuel ratios, rate and extent of change of these and other factors that affect combustion efficiency). We believe limiting CO levels is also reasonable because: (1) it is a widely practiced approach to monitoring combustion efficiency—many boilers and industrial furnaces are already equipped with flue gas oxygen monitors [34] and some are equipped with CO monitors; (2) although the annualized cost of oxygen and CO monitoring is estimated to be $20,000 (see Section II of Part Six), the monitors may in part pay for themselves in fuel savings resulting from operating the boiler or industrial furnace closer to maximum combustion efficiency; and (3) well designed and operated boilers and industrial furnaces can easily be operated in conformance with the proposed CO limits.

d. *Proposed CO limits.* The Agency is proposing the following limits on flue gas carbon monoxide (CO) levels, corrected to a 7 percent flue gas oxygen content.

CO limits	Consequence of exceeding limit
If >100 ppm average for any 60 minute period (rolling average).	Waste feed shutoff within 10 minutes.
If >500 ppm average for any 10 minute period (rolling average).	Immediate waste feed shutoff.

Both limits would apply. Test burn data and discussions with owners and operators of boilers and industrial furnaces indicate that these CO limits are readily achievable.[35]

[33] 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.

[34] Oxygen monitoring would be required in conjunction with CO monitoring to adjust CO levels to a common excess air rate indicated by excess oxygen content in the flue gas. Correcting CO levels to a common flue gas oxygen content avoids the problem of having (otherwise) high CO levels diluted by large quantities of excess air. This issue is discussed further in the next section of the text.

[35] We note, however, that boilers that are well-operated (and typically equipped with CO monitors) may operate at CO levels of 150 to 250 ppm to maximize boiler efficiency. To optimize boiler efficiency (i.e., minimize the fuel required to generate 1,000 lbs. of steam), boilers are operated under slightly fuel-rich conditions. The energy lost from the relatively high stack gas CO levels is more than offset by the energy that would be required to heat ambient air fed to the combustion zone to increase fuel burnout (i.e., CO combustion, and combustion of carbon in coal and oil ash). Thus, to meet the proposed CO standards, some well-operated, finely-tuned boilers may have to operate at a lower boiler efficiency to operate at the high combustion efficiency required by the proposed CO limits. EPA believes that few boilers burning hazardous waste are currently equipped with CO monitors and would be required to operate under less thermally efficient conditions under this proposal. Nonetheless, the Agency specifically requests comments on this issue.

The 100 ppm limit is indicative of steady-state (i.e., normal), efficient combustion conditions. The higher limit of 500 ppm and the time weighted average for both limits are provided to accommodate the CO spikes that inevitably occur when hazardous waste fuel firing starts or when, for example, there is a load change on an industrial boiler. Test burn data and discussions with owners and operators indicate that the proposed limits and duration of exceedences will enable owners and operators to bring combustion conditions back to maximum efficiency after normal, routine "upsets" caused by initiating waste firing, load changes, etc.

Given that CO is a sensitive indicator of overall combustion conditions and may be a conservative indicator of POHC and PIC destruction, we are proposing time-weighted averages of exceedences rather than fixed limits. Fixed limits that do not acknowledge inevitable CO spikes and that do not give owners and operators time to retune combustion conditions could actually result in greater emission of incompletely burned organics. This is because each time hazardous waste firing is interrupted, CO will spike and emission of incompletely burned organics may increase. Thus, any controls on CO must strike a balance between the organic emissions that result from an overly-stringent CO limit that requires frequent waste feed interruptions versus the emissions that result from less stringent controls that acknowledge inevitable CO spikes.

We are proposing that the CO limits be based on a flue gas oxygen content of 7 percent. It is necessary to correct CO levels for flue gas oxygen content because (otherwise) high CO flue gas concentrations could be diluted by high rates of excess air. Although a boiler or industrial furnace may be operating under conditions that result in poor combustion efficiency and a high CO mass emission rate per unit of time, CO flue gas concentrations could be diluted to levels that meet the proposed limits if the device were operated at high excess air rates (which in itself could reduce combustion efficiency and increase the CO mass emission rate[36]).

We are proposing that CO be corrected to a flue gas oxygen content of 7 percent because we believe that the majority of boilers and industrial furnaces require flue gas oxygen levels of about 7 percent when burning hazardous waste at high combustion efficiency. We are aware, however, that optimum flue gas oxygen levels may range from 3 percent to 10 percent for these devices. Further, the optimum oxygen level to achieve high combustion efficiency for a given device will vary depending on factors such as fuel mix and boiler load. Although large combustion devices generally have optimum oxygen requirements on the low end of the range and smaller units on the upper end of the range, we believe that a level of 7 percent is reasonable given that it is in the middle of the range and that the majority of devices burning hazardous waste fuels have moderate heat input capacities (e.g., 20–150 MM Btu/hr).

We should note that, for the smaller devices with optimum oxygen requirements greater than 7 percent, as the gap widens between their optimum oxygen level and the 7 percent oxygen level selected for correcting CO levels, the CO limits effectively become more stringent. Even though these smaller devices may be operating at optimum excess air levels (i.e., at greater than 7 percent excess oxygen levels) and achieving high combustion efficiency and minimum CO levels, the proposed correction factor of 7 percent oxygen in effect presumes they should be operating at a lower excess air level. Thus, this approach presumes their CO levels have been diluted and requires a correction to the lower excess oxygen rate. For purposes of determining compliance with the proposed CO limits, their actual CO levels would be increased to those that would result from the "optimum" excess oxygen level of 7 percent.

Larger devices with optimum oxygen levels lower than 7 percent would not be adversely affected, since correcting to 7 percent oxygen would lower their measured CO levels.

EPA specifically requests comments on whether the proposed approach for limiting CO levels is appropriate, including the proposed limits, averaging times, and the requirement to correct CO levels to 7 percent flue gas oxygen levels. We also specifically request comment on whether a limit is needed on the number of CO spikes per unit of time in addition to the proposed time-weighted average limits. A device could be operating during an extended period of frequent combustion upsets without necessarily exceeding the proposed time-weighted averages. Comments are requested on this option, including on appropriate CO trigger spike level (e.g., 300 ppm) and an appropriate limit on the frequency (e.g., no more than 10 spikes per 15 minutes). Comments should include supporting documentation or data for any of the above issues.

EPA is specifically requesting comments on the appropriateness of these CO limits for cement kilns. Recently, it has come to the Agency's attention that cement kilns may have a problem meeting the proposed CO limits. Apparently, trace organic materials in the feedstock are burned-off as the feedstock moves through the kiln from the feed end to the hot end where fuels are fired. The burning of these trace organic materials apparently causes cement kilns to have a high baseline CO emission rate (e.g., 200–350 ppm) that is unrelated to the combustion of fuels in the hot end of the kiln. Therefore, EPA is requesting comments on: (1) Whether a different set of CO limits should be implemented for these devices (e.g., the proposed limits superimposed on a baseline CO emission rate); or (2) whether another monitoring method (e.g., nitrogen oxides) should be used for these devices. Commenters should document their positions keeping in mind that the Agency's goal is to provide for continuous monitoring of combustion efficiency to minimize PIC emissions from the burning of hazardous wastes.

EPA is proposing that if the 100 ppm time-weighted average limit is exceeded, the hazardous waste feed must be shutoff within 10 minutes. This allows the operator time to effect a controlled waste shutoff and to switch to another fuel. If, however, the 500 ppm time-weighted average limit is exceeded, we are proposing that the hazardous waste feed be shutoff immediately given that the device is in a major upset condition and is not operating anywhere close to high combustion efficiency.[37] Further, we are proposing that the hazardous waste feed cannot be restarted after a required shutoff until the operator demonstrates that the device can operate at maximum combustion efficiency for a reasonable period of time. Thus, we are proposing that hazardous waste firing cannot resume until the device is operated without exceeding a time-weighted average CO level of 100 ppm for an averaging period of not less than 10 minutes nor more than 60 minutes. We are proposing the 60 minute maximum averaging time

[36] High excess air rates can decrease combustion efficiency by "quenching" the flame with cooler ambient air resulting in lower combustion zone temperatures, and, ultimately, an unstable flame.

[37] EPA specifically requests comments on whether a controlled waste feed shutoff (e.g., over a 2-minute period) would be more appropriate than an immediate shutoff requirement when the 500 ppm limit is exceeded. A controlled shutoff may result in lower emissions of unburned organic compounds by allowing the operator to replace gradually the hazardous waste with other fuels, thus reducing "shock" to the combustion process.

period given that it is the basic CO performance standard indicating high combustion efficiency. If an operator can retune his boiler quickly, however, we do not believe he should have to wait the 60 minutes required under the basic CO standard to demonstrate that his CO levels do not exceed 100 ppm on average. Given that shorter averaging periods are actually more stringent because the operator has less time to offset CO levels greater than 100 ppm with levels lower than 100 ppm, we believe that shorter periods should be allowed. A 10 minute minimum averaging period is proposed because it is short enough to allow operators to resume burning hazardous waste quickly once they retune combustion controls and long enough to demonstrate that low CO levels can be maintained.

We are proposing that, if the CO limits are exceeded an aggregate of 10 times in a calendar month, the owner or operator must cease burning hazardous waste and notify the Regional Administrator in writing within 5 calendar days. In addition, the owner or operator may not resume burning hazardous waste unless and until written permission is received from the Regional Administrator. Depending on the circumstances, the Regional Administrator may modify the permit requirements (or place special conditions on interim status operations) to ensure that the device can be operated within the CO limits or to minimize the risks from emissions of incompletely burned organics if the device continues to exceed the limits. Those special conditions could include limits on waste firing rates and the types of waste that may be burned to ensure that the CO standard can be met. EPA specifically requests comments on this approach.

Finally, EPA is proposing to apply the CO (and DRE) requirements for blast furnace systems burning hazardous waste only to the stoves and boilers burning the blast furnace off-gas. These devices use approximately 93 percent of the off-gas generated (see Part One, Section IV.B.4 of this preamble). The remaining off-gas is burned in miscellaneous devices such as coke ovens, reheat furnaces, flares, etc. EPA is proposing not to limit CO (and DRE) from these burners since they burn such a small percentage of the off-gas. EPA specifically requests comments on whether this approach is appropriate.

C. Waiver of Trial Burns for Boilers Operated Under Special Operating Requirements

The DRE performance standard would be implemented for boilers and industrial furnaces very much as it is currently implemented for incinerators under Subpart O of Part 264, with one major exception for certain boilers, as discussed below. Industrial furnaces and boilers not operated under certain special conditions would demonstrate by conducting a trial burn that they can achieve the required DRE (99.9999 percent for dioxin-containing wastes and 99.99 percent for all other wastes) for specific organic compounds identified in the hazardous waste feed.

As a result of the nonsteady-state boiler testing discussed above, EPA believes that boilers operated under the special operating requirements discussed below will maintain a hot, stable, primarily fossil fuel flame conducive to maintaining high combustion efficiency, and resulting in maximum destruction of organic constituents in the hazardous waste fuel. EPA believes that these boilers will achieve at least a 99.99 percent DRE of organic constituents in the waste, and, therefore, a trial burn to demonstrate DRE is not necessary. Thus, EPA is proposing to waive automatically the requirement to conduct a trial burn to demonstrate DRE for boilers operated under the special operating requirements.[38]

Although the steady-state boiler tests indicate that boilers operating outside of the envelope of the special operating requirements identified below can also be operated to achieve maximum combustion efficiency and at least 99.99 percent DRE, the less the boiler operates as a primarily fossil fuel burner the greater the uncertainty that a hot, stable, and efficient flame can be maintained continuously. Thus, case-by-case trial burns would be required for those boilers (and all industrial furnaces) to determine that set of operating conditions necessary to ensure 99.99 percent DRE.

The special operating requirements requisite to an automatic waiver of a trial burn to demonstrate DRE require that: (1) The boiler must burn at least 50 percent of the fossil fuels oil, gas, or coal; (2) the boiler must be operated at a load of at least 25 percent of its rated capacity; (3) the hazardous waste fuel must have a heating value of at least 8,000 Btu/lb; and (4) the hazardous waste fuel must be fired with an atomization firing system. In addition to these special conditions for the waiver of a trial burn, these boilers, like other boilers and all industrial furnaces, would be subject to the carbon monoxide flue gas limits (implemented by continuous monitoring of CO and oxygen) discussed above, and could not burn hazardous waste during boiler start-up or shut-down operations. The basis for these requirements is discussed below.

1. *A minimum of 50 percent of the fuel fired to the boiler must be gas, oil or coal.* Cofiring with fossil fuels (or fuels derived from fossil fuels) as the primary fuel is required to ensure a hot, stable flame conducive to destruction of organic constituents in the waste. Other fuels (e.g., wood waste) may not provide hot, stable combustion zone conditions.

A minimum fossil fuel firing of 50 percent, on a total heat input or volume input basis, whichever results in the greater volume of fossil fuel, would be required to ensure a hot, stable flame. We are proposing a minimum 50 percent fossil fuel burning requirement because nearly all of the nonsteady-state boiler tests were conducted with hazardous waste cofired with oil or gas at less than a 50 percent firing rate. We specifically request comments and any relevant supporting data on whether the proposed 50 percent minimum firing rate is appropriate.

2. *Boiler load must be at least 25 percent.* We are proposing to limit boiler load when burning hazardous waste fuel to 25 percent of the boiler's rated heat input capacity because the combustion flame can be cooler and less stable at very low load factors. At low loads, higher excess air rates are used to improve fuel/air mixing. The increased excess air rates, however, can also cool the flame zone and even make the flame unstable (e.g., as a candle flame flickers in a breeze). These conditions can result in reduced combustion efficiency and destruction of organic constituents in the waste. Finally, EPA's nonsteady-state boiler tests were conducted at boiler loads of greater than 25 percent.

We specifically request comment and supporting documentation on whether the minimum 25 percent limit on boiler load is appropriate.

3. *The hazardous waste fuel, as fired, must have a heating value of at least*

[38] Emissions testing for boilers operating under the special operating requirements would be avoided entirely if the hazardous waste meets the proposed specification levels for certain metals and chlorine, as discussed in Sections III and IV of Part Three of the preamble. We note that even when emissions testing would not be required under today's proposed rule, a permit under the normal permitting procedures (e.g., Part A and Part B permit applications, opportunity for public hearings) would still be required. See Section I.A.2 of Part Four of the preamble for an explanation.

8,000 Btu/lb. We are proposing the minimum heating value of 8,000 Btu/lb because: (1) It represents the lower range of heating values of fossil fuels; (2) hazardous waste with a lower heating value is not generally burned in boilers [39]; and (3) few boilers burning hazardous waste with a lower heating value have been field-tested to determine if they can achieve 99.99 percent DRE and low CO emissions.

This heating value limit is imposed on the waste on an as-fired basis.[40] Thus, hazardous waste with low heating value may be mixed with other wastes or fuels to meet the 8,000 Btu/lb limit for the mixture. We are allowing mixing to meet this heating value limit even though heretofore mixing was not allowed to increase heating value to avoid sham recycling because our concern here is how the material will burn in a regulated and controlled device. Our concern with heating value previously has been to prevent the sham recycling of wastes with *de minimis* heating value by burning in unregulated boilers and industrial furnaces to avoid the cost of incineration.

Although our survey data [41] and discussions with industry representatives [42] indicate that hazardous waste fuels are typically cofired through separate firing nozzles rather than blended with fossil fuels (except when burned in *de minimis* quantities), some hazardous waste fuels may be blended with fuel oil so that the blend is the boiler's sole fuel. In those cases where hazardous waste with a heating value of less than 8,000 Btu/lb is blended with fuel oil or other fossil fuel and where the blend is the boiler's sole fuel, the owner or operator must show by calculation that, after considering the quantity of fossil fuel required to raise the heating value of the waste/fuel mixture to 8,000 Btu/lb, the remaining volume of fossil fuel provides a minimum of 50 percent of the boiler's heat input (or volume input whichever results in the greater volume input). This will ensure that the boiler meets both the waste heating value special condition and the fossil fuel firing special condition. Thus, this prevents a situation, albeit remote, where a 45/55 percent, waste/fossil fuel blend is fired as the sole fuel where the blend has heating value of just greater than 8,000 Btu/lb because of the very low heating value of the waste. We want to preclude this situation because such a low heating value mixture may not burn with the hot, stable flame that the fossil fuel firing condition is intended to provide.

We specifically request comment on whether the proposed minimum 8,000 Btu/lb heating value is appropriate.

4. *The hazardous waste fuel must be fired with an Atomization firing system.* Only liquid wastes fired with an air or steam atomizer, a mechanical atomizer, or a rotary cup atomizer are eligible for the automatic trial burn waiver. Hazardous wastes that are solids, or liquids fired with a lance (i.e., essentially a pipe that fires a stream of liquid rather than small droplets into the combustion zone) are not eligible.

An organic compound must be vaporized and mixed with air before combustion can occur. The quicker the waste and its constituents are vaporized and the more completely the volatilized compounds are mixed with air, the more rapid and efficient the combustion and destruction of organic constituents. Firing systems that atomize liquid wastes to form small droplets increase the rate of vaporization by providing a larger surface area per volume of waste to absorb heat from the flame.

We are proposing to allow the use of virtually all atomization systems commonly used to fire hazardous waste. We are, however, for some types of atomizers, proposing to restrict the viscosity and maximum size of solids for the as-fired hazardous waste to ensure that the appropriate droplet size is achieved [43] and to minimize plugging of the firing nozzle. The acceptable atomization systems and restrictions on waste viscosity and maximum size of solids are proposed as follows:

TABLE 1.—VISCOSITY AND PARTICLE SIZE LIMITS FOR ATOMIZATION SYSTEMS

Atomization systems	Waste viscosity limits (SSU)[1]	Maximum size of solids (mesh)
High pressure air or steam atomization (>30 psig).	150 to 5,000	200
Low pressure air atomization.	200 to 1,500	200
Mechanical atomization.	<150	200
Rotary cup atomization.	175 to 300	100

[1] SSU: Seconds, Saybolt Universal.

a. *Air or steam atomization.* Air or steam atomization systems use air or steam to break up the fuel into small droplets. Under ordinary operations, high pressure steam or air provided at 30 to 150 psig produces much smaller droplets than other atomization systems. Because of the cost of providing high pressure air and where steam is not readily available, low pressure (1–5 psig) burners are sometimes used. Low pressure air atomization burners cannot effectively handle the wide range of viscosities that the high pressure systems can handle.

b. *Mechanical atomization.* Mechanical atomizers break up the fuel into small droplets by forcing it through a small, fixed orifice. A strong cyclonic or whirling velocity is imparted to the fuel before it is released through the orifice. Combustion air is provided around the periphery of the conical spray of fuel. The combination of combustion air introduced tangentially into the burner and the action of the swirling fuel produces effective atomization.

The size of the droplets produced by mechanical atomization is a function principally of the fuel viscosity and the fuel pressure at the atomizing nozzle. Because of the dependence of the droplet size on viscosity, mechanical atomizers are not applicable above viscosities of about 150 SSU. The pressure required to produce a droplet size conducive to optimum combustion efficiency depends on the volatility of the fuel. Highly volatile materials can volatilize rapidly even from larger droplets and, thus, can be fired at pressures of 75 to 150 psig. Less volatile fuels may require an atomization pressure of about 1,000 psig to form

[39] As discussed in Section II of Part Two of the preamble, EPA has heretofore considered the burning of hazardous waste with an as-generated heating value of less than 5,000–8,000 Btu/lb in boilers or industrial furnaces to be sham recycling subject to regulation as incineration.

[40] We are aware that hazardous waste with a heating value less than 8,000 Btu/hr is sometimes cofired in the same burner (i.e., firing nozzle) as fossil fuel. Although the waste is not physically blended before firing, the waste is blended with the fossil (or other) fuel in the flame envelope from the burner. We specifically request comment on whether such mixing with high heating value fuels after firing meets the objectives of the minimum waste heating value requirement, and how an allowance for such mixing could be structured in implementable and enforceable regulatory language.

[41] WESTAT, *Final Report for the Survey of Waste as Fuel: Track II*, November 1985.

[42] Keystone Center Workshop, February 11, 1985; Meetings with the Council of Industrial Boiler Owners on December 5, 1985, and October 9, 1986.

[43] The maximum viscosity is limited to ensure that resulting droplets will not be too large for optimum volatilization. Minimum viscosity is also limited to ensure that the droplet size is not too small—to ensure that a "fog" is not formed which could slow the rate of volatilization and, thus, combustion by reducing the radiant heat absorption of the droplets within the "fog."

droplets small enough to rapidly volatilize.

Given that fuel pressure is an important factor in determining droplet size, we believe it would be prudent to place requirements on minimum fuel pressure.[44] Optimum fuel pressure to produce an optimum droplet size, however, is a function of fuel volatility and fuel/air mixing. Thus, it is not practicable to propose specific limits on minimum fuel pressure. Rather, we are proposing that the boiler owner or operator be required to maintain fuel pressure within the atomization system design range considering the viscosity and volatility of the waste fuel, the fuel/air mixing system, and other appropriate parameters. Although this approach would entrust the atomization system manufacturer or designer (e.g., if designed and fabricated on-site) with determining an acceptable fuel pressure considering the specifics of the situation, we believe it is an acceptable approach. If fuel pressure is not maintained at appropriate levels to ensure small droplet size and optimum combustion efficiency or, if for any other reason the boiler does not achieve maximum combustion efficiency, the boiler will not be able to meet the combustion efficiency performance standard—the CO flue gas limits discussed above.[45]

Finally, to minimize erosion and plugging of the firing nozzle, we are proposing to limit the maximum particle size of solids in the as-fired waste to 200 mesh.

c. *Rotary cup atomization.* The rotary cup atomizer uses centrifugal force to break up the fuel into droplets. It consists of an open cup mounted on a hollow shaft. The fuel is pumped at low pressure through the hollow shaft to the cup which is rotating at several thousand revolutions per minute. A thin film of the fuel is centrifugally torn from the tip of the cup. As centrifugal force drives the fuel off the cup, combustion air is admitted in a rotation counter to the direction of the cup. This counter motion of the air breaks up the conical sheets of fuel into droplets and provides turbulence for mixing the droplets with air.

Rotary cup atomizers are typically used on smaller boilers (e.g., less than 30 MM Btu/hr heat input) because the maximum capacity of the largest unit is 1,400 pounds of fuel per hour. In addition, rotary cup atomizers are not often installed on new boilers because it is difficult to achieve optimum fuel/air mixing over a wide range of fuel flow rates. Rotary cup atomizers are used because they are relatively inexpensive, they can handle fuels with viscosities ranging from 170 to 300 SSU, and they are relatively insensitive to solid impurities in the fuel and can handle wastes with solids that can pass through a 100 mesh screen.

Droplet size is related primarily to the viscosity and flow rate of the waste and rotational speed of the cup. Resulting combustion efficiency is related to volatility of the waste and fuel/air mixing. Although it is impracticable to control these variables in a regulatory context, manufacturers and boiler owners and operators have ample experience with rotary cup atomizers to design units that achieve efficient combustion. Thus, we are proposing to require that owners and operators demonstrate that the as-fired waste has a viscosity and volatility within the design parameters of the firing system and limit waste flow rates consistent with the design parameters of the firing system. As discussed above, relative to mechanical atomization systems, if, in fact, the device does not produce droplet sizes and fuel/air ratios conducive to maintaining high combustion efficiency, the boiler will not be able to meet the combustion efficiency performance standard implemented by limiting flue gas CO levels.

D. Start-Up and Shut-Down Operations

Combustion devices do not burn fuels efficiently during start-up or shut-down operations, as evidenced by smoke emissions and high flue gas CO levels. Thus, we are proposing to prohibit the burning of hazardous waste fuels at these times.[46] (We note that EPA's incinerator regulations at 40 CFR 264 and 40 CFR 265 also prohibit the burning of hazardous waste during start-up and shut down operations.) Boilers operated under the special conditions for the automatic waiver of a trial burn as well as all other boilers and all industrial furnaces would be subject to this prohibition.

We are proposing to allow hazardous waste firing once the boiler reaches steady-state combustion conditions and is achieving maximum combustion efficiency. We believe the requirements proposed for when a boiler may resume hazardous waste firing after a required waste shutoff because of a CO exceedance should also apply here. See Section III.B.5.d of this part of the preamble. Thus, hazardous waste firing could begin after start-up once the operator demonstrates that the boiler is operating without exceeding a time-weighted average CO level of 100 ppm for either 10 minutes or 60 minutes.

With respect to shut-down operations, boilers operated under the special conditions for the automatic waiver of the trial burn could not burn hazardous waste when boiler load is less than 25 percent of the boiler's rated heat input capacity. Shut-down conditions for boilers conducting trial burns would be determined individually. Thus, those boilers would be allowed to fire hazardous waste fuel at loads of less than 25 percent if they demonstrate during the trial burn that they can meet the DRE performance standard and the CO limits when operating at low loads.

E. Waiver of Trial Burn and CO Limits for Low Risk Waste

A number of hazardous wastes may pose a risk of 10^{-6} or less to human health even if burned under poor combustion conditions—wastes containing only relatively low toxicity organic compounds like toluene, chloromethane, phthalates, benzene, methylene chloride, formaldehyde, trichloroethene, 1,1,1-trichloroethane, trichlorophenol, or vinylchloride, and wastes containing relatively moderate toxicity organic compounds burned at low firing rates. In either case, such wastes may pose insignificant health risk absent the organic emissions controls and, thus, should be exempt from those controls.

To address this issue, EPA is proposing a site-specific, risk-based

[44] Mechanical atomizers are susceptible to erosion of the orifices in the firing nozzle. Erosion can increase the size of the orifice resulting in decreased fuel pressure and increased droplet size. Limits on minimum fuel pressure, thus, would ensure that droplet size remains optimized during the course of operations by either increasing fuel pressure as the nozzle erodes and, more likely, replacing an eroded firing nozzle.

[45] As a matter of fact, it could be argued that *any* requirements other than the combustion efficiency performance standard (i.e., the CO limits) are unnecessary given that DRE is maximized and emission of incompletely burned organics are generally minimized at high combustion efficiency. EPA is proposing additional controls because we believe it is prudent to be conservative given that trial burns are automatically waived for boilers meeting these conditions and that the Agency has never before used flue gas CO as the sole test of combustion efficiency and adequacy of destruction of organic constituents in a waste. Further, the special conditions do not pose a significant burden on the regulated community, in that industry representatives have indicated that they agree that limiting CO to ensure high combustion efficiency is reasonable.

[46] Except that small quantity burners may burn hazardous waste during start-up and shut-down because: (1) they burn extremely small quantities of waste (i.e., less than 1 percent of fuel requirements) and, thus, the risk posed by PIC emissions resulting from burning the hazardous waste would be relatively small compared to the risk posed by PIC emissions resulting from the primary fuel; and (2) a prohibition on such burning would be impractical for small quantity burners given that they typically mix their hazardous waste with their primary fuel.

waiver of the destruction and removal efficiency (DRE) standard, the trial burn, and the flue gas CO limits. Under the waiver, an owner or operator must develop a reasonable, worst-case estimate of emissions of organic compounds and use dispersion modeling to predict maximum annual average ground level concentrations. Procedures for conducting the risk assessment will be provided in a guidance manual for permit writers entitled "Guidelines for Permit Writers: Permitting Hazardous Waste Combustion Facilities Using Risk Assessment." That guidance manual is referred to as the Risk Assessment Guideline or RAG. Those procedures are discussed below. For threshold compounds, the predicted concentrations must be compared to reference air concentrations identified in the RAG. For carcinogenic compounds, the predicted concentrations must be used to estimate the increased risk resulting from a lifetime exposure to the maximum annual average ground level concentration. The incremental risk cannot exceed an aggregate risk to the MEI from all carcinogenic compounds of 10^{-5}. Risk-specific doses (RSDs) corresponding to a 10^{-5} risk are provided in Appendix B to this preamble and will be included in the RAG.

To be eligible for the waiver, EPA must have identified in the RAG either a reference air concentration (RAC) (for threshold compounds) or a risk-specific doses (RSD) (for carcinogenic compounds) for every organic compound listed in Appendix VIII of 40 CFR Part 261 that is a constituent of the waste. Clearly, without adequate health effects data for a compound, a risk assessment cannot be conducted. Unfortunately, EPA currently has data adequate for establishing RACs and RSDs for only about 150 of the over 400 compounds on Appendix VIII. A number of wastes should nonetheless be eligible for the waiver because health effects data are available for many of the more common constituents. As additional data become available and the Agency establishes RACs or RSDs for additional compounds (or changes RACs or RSDs already established), the RAG will be revised to incorporate the information. Given that the RAG is incorporated by reference in today's proposed rule, any revisions will be noticed in the **Federal Register** as required by § 270.6(b).

The requirements for estimating emissions, dispersion modeling, and evaluating health effects are discussed below. These requirements will be discussed in detail in the RAG.

1. *Estimating emissions.* To estimate reasonable, worst-case emissions of combined constituents in the waste, the owner or operator must: (1) Identify every Appendix VIII organic constituent that could reasonably be expected to be found in the waste; (2) assume a reasonable, worst-case DRE (destruction and removal efficiency) for each constituent of 99%; and (3) assume a reasonable, worst-case emission rate of PICs (products of incomplete combustion) using a PIC/POHC emissions ratio of 5 to 1 (i.e., 5 grams of PICs are emitted per gram of unburned POHC at 99% DRE). For purposes of this waiver, a POHC is any Appendix VIII constituent found in the waste at detectable levels using analytical procedures specified by "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA Publication SW-846 (See § 260.11).

A DRE of 99% is considered very conservative given that we never measured a DRE of less than 99.9% during the nonsteady-state testing of three boilers that were intentionally operated during upset conditions as evidenced by high CO and smoke emissions. A DRE of just less than 99.9% (but greater than 99%) was recorded during one of the 11 other steady-state boiler tests. That situation, however, is considered both atypical and suspect because: (1) the boiler burned waste wood mixed with creosote sludge on a grate; and (2) the DRE calculation is suspect because there is reason to believe that some POHC may have been a constituent of the waste wood (which was not analyzed) as well as the sludge.

A PIC to POHC ratio of 5 also appears to be conservative given that the ratio was generally 0.5 to 5. Although higher ratios were recorded, there is reason to doubt many of the higher values. See discussion in Section III.B.5.

2. *Dispersion modeling.* Dispersion modeling of emissions is to be conducted in conformance with "Guideline on Air Quality Models (Revised)," EPA Publication Number 450/2-78-027R, July 1986. The guideline is available from the National Technical Information Service, Springfield, Virginia (Order No. PB 86-245248).[47]

Although the guideline is not a "cookbook" approach to conducting dispersion modeling, EPA, the States, and the regulated community have used the guideline for a number of years to select dispersion models to determine compliance with a number of Clean Air Act standards (e.g., particulate and lead National Ambient Air Quality Standards, regulations for the Prevention of Significant Deterioration (PSD)). Owners and operators seeking a waiver under this provision must submit a dispersion modeling plan with Part B of their permit application. The Director will determine if the proposed plan is in conformance with the Guideline and may require alternative or supplementary modeling.

Owners and operators of interim status facilities seeking a waiver under this provision, however, must submit with Part B of their permit application the results of their dispersion modeling. Further, the Part B application must be submitted six months after promulgation of the final rule (which would be six months before the effective date of the flue gas CO limits for interim status facilities). In effect, submission of Part B of the permit application seeking this waiver is required in lieu of compliance with the CO limits. The schedule for submission of the Part B with the results of dispersion modeling based on the above schedule will allow the Director six months to review the application for adequacy and reasonableness prior to the CO monitoring requirements coming into effect. This schedule is intended to assure that only those facilities that are qualified for the waiver will seek it and to discern those facilities merely trying to avoid CO monitoring requirements.

3. *Evaluation of health effects.* For compounds associated with noncarcinogenic health risks, the predicted ground level concentration must be less than the RACs identified in the RAG. If the RAG identifies RACs for both short-term and annual exposures (e.g., HCl), predicted ground level concentrations must be lower than either RAC.

For carcinogenic compounds, the predicted maximum annual average ground level concentration and the risk-specific doses (RSDs) provided by the RAG must be used to estimate the increased lifetime risk from each carcinogenic organic constituent in the waste. In addition, a reasonable, worst-case estimate of risk posed by PICs must be developed by assuming all PICs are carcinogens with a unit risk of 6.9×10^{-6}

[47] EPA specifically requests comments on whether the Guideline models are appropriate for predicting dispersion of organic compounds, metals, and HCl emitted from boiler and industrial furnace stacks to establish the national standards proposed today and to conduct case-by-case dispersion modeling to develop alternate, site-specific standards.

This corresponds to a risk-specific dose of 1 $\mu g/m^3$ at a 1×10^{-5} level of risk. That level for the PIC unit risk represents the weighted average unit risk of all chlorinated PICs identified during those nonsteady-state field tests where the boilers were intentionally operated under upset conditions.[48]

Given that EPA policy considers the risk from carcinogens to be additive, the risk from all the carcinogenic POHCs must be summed along with the cancer risk from PICs. The risks from carcinogenic organic emissions would not be considered significant if the aggregate risk did not exceed 1×10^{-5} (i.e., 1 in 100,000). This means that risks on the order of 10^{-6} would be allowed. EPA believes that this level of risk is reasonable for this purpose given the conservatism of the analysis and the comparable risk likely to be posed by burning only fossil fuels.[49/50]

IV. Proposed Controls for Emissions of Toxic Metals

A. Hazard Posed by Combustion of Metal-Bearing Wastes

In Appendix VIII of 40 CFR Part 261, the Agency has identified 12 metals that, if present in a solid waste, might be the basis for determining that the waste is a listed hazardous waste: antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, and thallium. Five of these metals (or their compounds) are known or suspected human carcinogens—arsenic, beryllium, cadmium, chromium, and nickel.

Hazardous wastes used as fuel in boilers and industrial furnaces can have high metal levels relative to those found in No. 6 fuel oil as shown in the table below. Metal-bearing wastes typically burned as fuel (usually in industrial furnaces) include spent nonhalogenated degreasing solvents used for metals cleaning and spent halogenated degreasing solvents mixed with spent oils or other high heating value organic liquid wastes. Metals emissions from burning these wastes are not currently controlled for boilers and the types of industrial furnaces that burn hazardous wastes and can result in increased lifetime cancer risks of 1×10^{-4} (i.e., 1 in 10,000).

TABLE 2.—COMPARISON OF METALS LEVELS IN HAZARDOUS WASTE FUELS AND NO. 6 FUEL OIL

Metal	Fuel oil (ppm) Mean	Fuel oil (ppm) Worst	Hazardous waste fuel (ppm) 50th percentile	Hazardous waste fuel (ppm) 90th percentile
Arsenic	0.36	5	<0.5	18
Cadmium	1.2	2	<0.5	10
Chromium	0.4	10	<5.0	300
Lead	3.5	10	8	572
Beryllium	0.08	0.38		
Nickel	24	73	<2	25
Barium	1.3	3.2	<5	251
Mercury	0.006	10	<0.05	<1.0

Source: Engineering-Science, *Background Document for the Development of Regulations to Control the Burning of Hazardous Wastes in Boilers and Industrial Furnaces,* Volume III, February 1987.

Under the Clean Air Act (CAA), EPA has established emission standards for beryllium and mercury for certain categories of sources (40 CFR Part 61), and has recently promulgated standards (for particular emissions) to control arsenic emissions from certain categories of sources (51 FR 27956 (August 4, 1986)). These emission standards were developed considering the quantities and types of metal emissions, current control practices, the risks posed by current practices, and the economic impacts on the industry of reducing emissions. Therefore, these emissions standards are not necessarily protective when applied to boilers or industrial furnaces burning hazardous waste fuel.

In addition to these metals emissions standards under the CAA, EPA has established National Ambient Air Quality Standards (NAAQS) for lead and particulates. These ambient standards are implemented by the States under the State Implementation Plan (SIP) program, and control major sources of lead and particulate emissions. Lead emission standards have not been established under the SIPs for any boilers and the EPA is unaware of any lead standard for industrial furnaces that burn hazardous waste fuel.

Particulate emission standards, however, established under the SIPs in conformance with the particulate NAAQS, or by EPA as New Source Performance Standards (NSPS), do apply to some boilers and virtually all industrial furnaces burning hazardous waste. The particulate standards limit metals emissions generally to the extent state-of-the-art particulate control technology will allow—high efficiency electrostatic precipitators (ESPs) or fabric filters are usually required to meet the standards. These particulate standards may not, however, adequately control metals emissions from burning hazardous waste fuels in boilers and industrial furnaces for a number of reasons: (1) the standards do not apply to gas and oil-fired boilers that represent a large number of hazardous waste fuel burners; (2) smaller coal-fired boilers are not subject to NSPS standards and may not be required under the SIPs to be equipped with ESPs or fabric filters; (3) large volumes of hazardous waste fuel are burned by light-weight aggregate kilns that are equipped with low pressure wet scrubbers that may not be highly efficient at collecting particules in the <1 micron range, the size range containing the bulk of the metals; and (4) the risks posed by metals emissions from these boilers and industrial furnaces that are equipped with ESPs, fabric filters, and wet scrubbers can increase substantially when hazardous waste fuel is burned given that the levels of some metals, particularly chromium and lead, can be much higher in hazardous waste than in coal as shown in the table below:

Metal	Bituminous coal (ppm) Average	Bituminous coal (ppm) Range	Hazardous waste fuel (ppm) 50th percentile	Hazardous waste fuel (ppm) 90th percentile
Arsenic	20.3	0.02–357	<0.5	18
Cadmium	0.91	0.02–100	<0.5	10
Chromium	20.5	0.5–70	<5.0	300
Lead	NA	0.7–220	8	572
Nickel	16.9	1.5–7300	<2	25
Barium	NA	NA	<5	251
Mercury	0.21	<0.01–3.3	<0.05	<1.0

[48] Engineering-Science, *Background Document for the Development of Regulations to Control the Burning of Hazardous Wastes in Boilers and Industrial Furnaces,* Volume III, February 1987.

[49/50] Radian Corporation, *Summary of Trace Emissions from and Recommendations of Risk Assessment Methodologies for Coal and Oil Combustion Sources,* July 1986.

Sources: Engineering-Science, *Background Document for the Development of Regulations to Control the Burning of Hazardous Wastes in Boilers and Industrial Furnaces*, Volume III, February 1987; Radian Corporation, *Summary of Trace Emissions and Recommendations of Risk Assessment Methodologies for Coal and Oil Combustion Sources*, July 1986.
NA=Not available.

B. Basis for the Metals Standards

1. *Overview.* EPA is proposing to control emissions of particular metals found to pose a significant health hazard by establishing a four-tiered regulation. Each tier is a standard that is protective on its own—a demonstration of compliance with any tier is sufficient. Tiers I–III are risk-based national standards that are back-calculated from a reference air concentration for lead and the 10^{-5} risk-specific dose for arsenic, cadmium, and chromium, using dispersion factors (i.e., $\mu g/m^3$ per g/s of emission) for reasonable, worst-case facilities. Tier I is a specification establishing maximum allowable metals levels for the hazardous waste or the hazardous waste as-fired (i.e., after blending). Tier II provides limits on the feed rate of metals to the device taking into account metals levels in the hazardous waste, other fuel, and industrial furnace feedstocks. Tier III provides emission limits for individual metals expressed as lb of metal per million Btu of heat input to the device. The Tier I and II limits are identical to the Tier III limits, but they are applied somewhat differently. The Tier I specification levels are expressed as lb of metal per million Btu of waste heating value. The Tier II feed rate limits are expressed as lb if metal per million Btu of total heat input to the device.

Given that the Tier I–III standards are national standards based on reasonable, worst-case facilities, in some instances they may be more stringent than necessary to protect human health and the environment.[51] Thus, to add flexibility to the regulations while still ensuring protection of human health and the environment, we are proposing as Tier IV the use of site-specific dispersion modeling to show that lead emissions from the facility will not result in an exceedance of the lead reference air concentration (RAC), and that emissions of arsenic, cadmium, and chromium will not result in an incremental lifetime cancer risk greater than 1×10^{-5}.

2. *Identification of metals of concern.* The Agency's risk assessment indicates that the following metals are likely to be found in hazardous waste fuels at levels that could pose adverse health effects: arsenic, cadmium, chromium, and lead. Nickel, if present in its suspected human carcinogenic forms—nickel carbonyl and nickel subsulfide—could also pose significant health risk. However, we believe that burning in boilers and industrial furnaces under the conditions required for compliance with these rules (a highly oxidizing environment) will not provide the proper conditions (reducing environment) to create these compounds. Thus, nickel is not being included in these proposed standards (see also 51 FR 34135 (September 25, 1986)). The EPA is continuing to study other nickel compounds with respect to carcinogenic potency and will propose controls for these nickel compounds if data indicate that standards are necessary. EPA specifically requests emissions data on the presence or absence of nickel carbonyl and nickel subsulfide from boilers and industrial furnaces burning hazardous waste.

The risk assessment used reasonable, worst-case assumptions for emission rates, dispersion of emissions, exposure, and health effects. From reference air concentrations (RACs) for noncarcinogenic metals and 10^{-5} risk-specific doses (RSDs) for carcinogenic metals, we back-calculated emission rates for several reasonable, worst-case facilities (a light-weight aggregate kiln facility, boiler facility, and cement kiln facility). See Section II for a description of these facilities and our exposure assumptions. We then back-calculated further to identify concentration levels of concern in the hazardous waste assuming the devices burned 100% hazardous waste with a heating value of 8,000 Btu/lb. The boilers were assumed to have no emissions control equipment, the light-weight aggregate kiln was assumed to be equipped with a low pressure wet scrubber, and the cement kiln was assumed to be equipped with an ESP.

Although the Agency does not believe that hazardous wastes are likely to contain levels of the other metals—antimony, beryllium, mercury, selenium, silver, and thallium—at levels that could pose adverse health effects, a particular waste may in fact contain those metals at levels of concern. To enable the permit writer to determine if these metals may be present at levels that pose significant risk, facility owners and operators would be required to provide with Part B of their permit applications an analysis for these metals if they could reasonably be expected to be constituents of the waste. EPA will provide guidance to permitting officials to enable them to conduct risk screenings to determine if these metals may pose a hazard. If so, more detailed emissions and dispersion modeling will be conducted under authority of the omnibus provision of section 3005(c) of HSWA. If necessary, appropriate controls on those metals will be included in the permit.

A number of conservative health effects assumptions were used in the risk assessment. These same assumptions have been used to develop the Tier I–III standards and the Tier IV RACs for noncarcinogens. In addition to the assumptions discussed in Section II, we made the following assumptions for chromium and lead.

We assumed that chromium is emitted in its most potent carcinogenic form, hexavalent chromium. We believe this assumption is conservative, but reasonable 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 nontoxic 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. Although preliminary investigations indicate that 99 percent of chromium emissions from fossil fuel, municipal waste, and sewage sludge combustion sources may be in the trivalent state, the Agency is not now

[51] We note, again, that the Tier I–III standards may not be fully protective in unusual scenarios (e.g., situations where tip downwash, complex topography, or highly unusual meteorological conditions affect ambient levels greater than considered in the reasonable, worst-case scenarios). We will provide guidance to permit writers to enable them to identify these situations and apply appropriate controls under authority of HSWA Section 3005(c). Moreover, given that the Tier I–III standards add substantial complexity to an already complex rule and that the permit writers must ensure in each situation (but particularly in complex terrain situations) that the Tier I–III standards are appropriate (i.e., that the site being permitted does not have highly unusual topographic, meteorologic, or stack release properties (including severe tip downwash)), EPA specifically requests comments on whether (1) for complex terrain situations, site-specific dispersion modeling should be required in all cases in lieu of the Tier I–III standards; and (2) site-specific dispersion modeling should be required in all cases for all terrain types in lieu of the Tier I–III standards.

able to conclude that hexavalent chromium emissions from hazardous waste combustion facilities also represent only 1% of total chromium emissions. This is because of the possibility that hexavalent chromium may be a constituent of hazardous waste and may be emitted without changing valence. Until EPA completes on-going studies on the risk posed by chromium emissions from hazardous waste combustion sources, the Agency proposes to assume chromium is emitted in the hexavalent state for purposes of this rule. Emission controls, however, under Tier III and Tier IV options, which are based on actual emission testing, are to be based on hexavalent chromium if the emissions testing is capable of reliably determining whether the chromium exists in the hexavalent state. Otherwise, the Tier III and IV standards shall be applied to the total chromium emission. (Of course, the Tier I and II standards apply to the total chromium present in the waste.)

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. The Agency specifically requests emissions data documenting the presence or absence of hexavalent chrome from boilers and industrial furnaces burning hazardous waste.

To consider the health effects from lead emissions, we adjusted the lead National Ambient Air Quality Standard (NAAQS) by a factor of one-tenth to account for background ambient levels. Thus, although the lead NAAQS is 1.5 $\mu g/m^3$, the lead RAC for purposes of this regulation is 0.15 $\mu g/m^3$.[52] (As discussed in Section II, the RACs for the other threshold compounds were based on 25 percent of the RfDs to account for other routes of exposure and exposure from other sources (e.g., background air levels).)

Finally, the risk-specific doses (RSDs) for the carcinogens were based on the unit risk estimates developed by EPA's Cancer Assessment Group and assuming an incremental lifetime cancer risk of 1×10^{-5}.

3. *Basis for the standards.* Rather than establishing risk-based standards, the Agency considered limiting metals emissions to the levels that could be emitted from burning No. 6 fuel oil. Hazardous waste fuel is often cofired with fuel oil in boilers without emission control equipment. Virtually all hazardous waste fuels currently burned are organic liquids (derived from petroleum) and are typically comprised of spent organic solvents, distilled bottoms from solvent recovery, and by-products from organic chemicals manufacturing. Thus, hazardous waste fuels typically displace fuel oils and they are stored, pumped, and fired very much like fuel oils.

There are a number of problems, however, with this approach. Hazardous waste is also cofired with, or in lieu of, coal and gas. In particular, most industrial furnaces that burn hazardous waste would otherwise be burning pulverized coal. The question then is whether the hazardous waste metal controls should be based on coal or oil. If it is to be based on coal, we must address the following issues: (1) should the comparison be to the mean, 95th percentile, or highest levels found in coal; and (2) should the coal burning device be assumed to be controlled with an ESP, a wet scrubber, or uncontrolled.

Another problem with basing the metals limits on levels that could be emitted from burning either fuel oil or coal is that, if 95th percentile or worst-case metals levels in the fuel oil or coal are used, risk levels could be significant—on the order of 1×10^{-4} (i.e., 1 in 10,000). (The health risks from burning oil or coal with mean levels of metals, however, would generally not result in significant health risk even under reasonable, worst-case scenarios.)

Because of these problems with basing metals limits for hazardous waste on levels resulting from the burning of fuel oil or coal, the Agency is proposing standards that are entirely risk-based.

4. *Tier I–Tier III standards.* The Tier I–Tier III standards are national standards back-calculated from a RAC for lead, and from 10^{-5} RSDs for arsenic, cadmium and chromium[53] using dispersion factors for reasonable, worst-case facilities. Given that the effects on ambient air concentration were different for each type of device (e.g., reasonable, worst-case boiler facility, cement kiln facility, lightweight aggregate kiln facility), we grouped the various devices into categories. See detailed discussion in Section II. There are two groups of categories, one for flat terrain and one for those devices in complex terrain. Each category has its own set of Tier I–III standards. The categories were selected based on similar health risk effects for the devices, i.e., impact on ambient air concentrations.

The flat terrain group of Tier I–III standards consists of three categories. Category 1 applies to sulfur recovery furnaces, asphalt kilns, halogen acid furnaces, and blast furnaces. Limits in this category are based on sulfur recovery furnaces since, for this category, this device has the greatest effect on ambient air concentrations.

Category 2 consists of light-weight aggregate kilns, lime kilns, and boilers. In this case, light-weight aggregate kilns are the basis for the limits for this category.

Category 3 consists of the wet and dry process cement kilns. These devices have the least effect on ambient air concentrations based on the ISCLT air dispersion modeling. Dry cement kilns are the basis for the limits in this category.

The limits for those devices in complex terrain are more stringent than if the devices are located in flat terrain. In addition, the categories for complex terrain are different from those for flat terrain in that there are four categories for complex terrain instead of three.

The Tier I–III levels for Category 1 in complex terrain apply only to blast furnaces. Emissions from these devices have the greatest impact in complex terrain. However, these devices should easily meet the Tier III requirements due to the type of process and air pollution controls required by existing air pollution regulations.

Category 2 for complex terrain consists only of sulfur recovery furnaces. Limits for these devices are about two times higher than for Category 1.

Category 3 for complex terrain consists of the majority of devices. This category includes asphalt kilns, light-weight aggregate kilns, lime kilns, halogen acid furnaces, and boilers. The Tier I–III limits are based on asphalt kilns since this device has the greatest impact on annual ambient air concentrations for this category.

Category 4 for complex terrain consists of cement kilns. These devices have the smallest effect on ground level concentrations, as was the case for flat terrain. Limits are based on dry process cement kilns.

All the limitations for Tiers I–III in complex and flat terrain are based on one device per site. If there is more than one device on a site, the limits for the largest device would have to be apportioned among all devices based on the thermal capacity of each device. However, permit conditions established

[52] This level represents a quarterly average. For the purposes of this regulation, an adjusted annual average of 0.094 $\mu g/m^3$ is being used. See footnote 17.

[53] The Tier I–III standards for arsenic, cadmium, and chromium are actually expressed as equations that ensure that the aggregate risk to the MEI from all three metals does not exceed 1×10^{-5}.

under Tier IV would consider all devices on the site (i.e., by multiple source dispersion modeling) in determining site-specific standards.

In addition, we note that the proposed Tier I-III standards may tend to overregulate some of the devices in each category. For example, Category 3 for complex terrain tends to overregulate all devices except asphalt kilns. This includes lime kilns, light-weight aggregate kilns, halogen acid furnaces, and boilers. The amount of overregulation is not very large, but if owners of such devices wish, they can comply with the site-specific, risk-based Tier IV standard which is, in effect, a waiver of the Tier I-III standards.

The Tier I standards are metals specification levels that apply to the hazardous waste on an as-fired basis (i.e., the levels apply to the waste directly or after any blending with other waste or fuel). The specification levels are expressed as lb of metal per million Btu of hazardous waste heating value and are equivalent to the values contained in the Tier III (and Tier II) standards. The Tier I specification levels are back-calculated from Tier III emission limits assuming the device burns 100% waste and all metal constituents are emitted.

The Tier I standards for lead would be a fixed limit (for each category). See proposed § 266.34-4(b)(1). The limits for the carcinogens arsenic, cadmium, and chromium, however, are not fixed, but rather are inter-related. The limits for each carcinogen depend on the levels of the others present. This is because the standards limit the aggregate (i.e., summed) risk to the MEI to 1×10^{-5}. Thus, a waste with a high concentration of one carcinogen must have relatively low concentrations of the other carcinogens so that the aggregate risk does not exceed the limit.

To demonstrate compliance with the Tier I standard, the owner or operator would simply analyze the waste. For lead, the waste would be in compliance if the lead level is no greater than that specified for the appropriate device category. For arsenic, cadmium, and chromium, the owner or operator would be required to use the Tier III equation for the appropriate category and show that the equation is satisfied (i.e., that the aggregate risk does not exceed 1×10^{-5}). The Tier I (and Tier II) limits are numerically equivalent to the Tier III limits. Only the units are different. See Appendix C for example calculations to apply the Tier I (and Tier II) standard.

The Tier II standards are metals feed rate limits expressed as lb of metal per million Btu of total heat input to the device. Feed rate limits would be established for arsenic, cadmium, chromium, and lead for all categories of devices. See proposed § 266.34-4(b)(2). The feed rate limits are implemented by an equation that computes the feed rate of each metal (in lbs/MM Btu) considering the metals levels and feed rates of other fuels and industrial furnace feedstocks. Compliance with Tier II is demonstrated by analysis of the hazardous waste, other fuels, and industrial furnace feedstocks for metals, documentation of feed rates, and a showing that the total metals feed rate does not exceed the Tier III metals emission limits. (Owners and operators would sample nonwaste feed materials only for the same metals found in the hazardous waste feed.) Thus, the Tier II standards are conservative in that it is assumed that all metals in all feed materials are emitted.

The Tier III standards are emission limits expressed as lb of metal per million Btu of total heat input to the device. The emission limits are back-calculated from the lead RAC and the 10^{-5} RSDs for arsenic, cadmium, and chromium using dispersion factors for the worst-case facility in each category. Compliance with Tier III is demonstrated by emissions testing.

5. *Tier IV standards.* The Tier IV standards require site-specific dispersion modeling that predicts that metals emissions will not result in an exceedance of the lead RAC and an aggregate risk (from arsenic, cadmium, and chromium) to the MEI of 1×10^{-5}. The RAC for lead (and other noncarcinogenic compounds) and the RSDs for the carcinogens will be identified in the Risk Assessment Guideline (RAG).[54] The RSDs are based on the unit risk estimates provided by EPA's Cancer Assessment Group and an aggregate increased lifetime risk to an individual exposed to the maximum annual average ground level concentration of 1×10^{-5} (1 in 100,000). See proposed § 266.34-4(b)(4). This is the same basis on which the Tier I-III standards were developed.

As discussed in Section III.D. dispersion modeling is to be conducted in conformance with EPA's Guideline on Air Quality Models. In addition, stack heights used to determine dispersion factors shall not exceed Good Engineering Practice as defined in 40 CFR Part 51.

EPA specifically requests comments on how many facilities are likely to elect to comply with the Tier IV standard (for metals or HCl) and, if the Tier IV standard were not available, the changes to equipment and operations that would be required to comply with the Tier I-III standards.

6. *Implementation of the metals controls.* The Tier I limits would be implemented by permit conditions that limit concentrations of the regulated metals in the waste, and waste fuel rates, and that specify waste sampling and analysis procedures. We are proposing that the concentration limits (as well as the limits developed under Tiers II-IV) represent maximum limits that can never be exceeded. We considered whether the limits should represent average values (e.g., hourly, daily, weekly, monthly, or even yearly averages). An argument could be made that a yearly average would be appropriate because the health effects data used to support the standards are based on maximum annual average exposures (except for HCl where a 3-minute maximum exposure drives the health risk). We believe, however, that allowing averaging would complicate operator recordkeeping and EPA inspection and enforcement activities. We specifically request comment on whether and how averaging should be allowed for compliance with the metals (and HCl) standards.

The Tier II standard would be implemented by permit conditions that limit concentrations and feed rates of the regulated metals in the waste, fuels, and industrial furnace feedstocks. Permit conditions would also specify sampling and analysis procedures for all feed materials.

The Tier III standard would be implemented by emission testing and permit conditions that: (1) Establish emission limits for each metal (including carcinogenic metals); (2) specify operating and maintenance requirements for any emission control equipment; (3) specify operating requirements for the system, as necessary, that relate to metals emissions rates (e.g., chlorine content of the waste); (4) limit concentrations of the regulated metals in the waste and limit waste feed rates; and (5) specify waste sampling and analysis procedures.

C. Impacts of the Metals Standards on the Regulated Community

Regulatory impacts and an analysis of the cost-effectiveness of the proposed rules are discussed in detail in Section 11 of Part Six. This section presents information on the ability of owners and operators to comply with the proposed metals controls.

[54] Risk Assessment Guideline is the short title for "Guideline for Permit Writers: Permitting Hazardous Waste Combustion Facilities Using Risk Assessment." (To be developed)

Based on conversations with owners and operators of industrial boilers and our analyses of hazardous waste fuels, it appears that industrial boilers can readily meet these proposed standards even though oil and gas fired industrial boilers are not equipped with emissions control devices. Industrial boilers typically burn waste generated onsite and the facilities that burn the largest volumes of wastes are organic chemicals manufacturing plants. These facilities burn relatively large quantities of organic liquid by-products that generally do not contain high levels of metals.

On the other hand, industrial furnaces, principally cement and light-weight aggregate kilns, accept huge volumes (e.g., 5 to 20 million gallons per year per facility) of hazardous waste generated off-site. These wastes are typically comprised of spent organic solvents and organic solvent recovery distillation bottoms. Many of the metals of concern to EPA do not interfere with the production of quality cement clinker or light-weight aggregate even at concentrations of several hundred or several thousand ppm, as evidenced by waste fuel specifications developed by industrial furnace operators. (Industrial furnace operators frequently obtain their hazardous waste fuels through a broker responsible for collecting hazardous waste from generators and blending the wastes to meet the operator's specifications.)

Although industrial furnaces typically burn hazardous waste fuels with very high metals levels, they are virtually always equipped with particulate emissions control devices because of the large quantities of particulates generated by processing the feedstocks (e.g., limestone in cement kilns, clay or shale in light-weight aggregate kilns). Not incidentally, these industrial furnaces are subject to Federal and/or State regulations for particulate emissions. Given that industrial furnaces are already equipped with particulate collection equipment and given that these devices can achieve substantial removal of metals as well (see Table 3), industrial furnaces in general, and cement kilns in particular, are expected to be able to meet the proposed metals standards readily. Cement kilns are equipped with electrostatic precipitators (ESPs) or fabric filters (FFs) that are expected to remove 98 to 99% of metals from stack gases.

Most light-weight aggregate kilns may not be able to burn hazardous waste fuels with high metals levels because they are typically equipped with low pressure wet scrubbers to control particulate emissions. Based on conversations with industry representatives, several light-weight aggregate kilns, however, are equipped with high pressure, relatively efficient venturi scrubbers with estimated metals collection efficiencies comparable to ESPs. Owners and operators would have a number of options if current collection efficiencies would not be adequate to meet the standards: (1) increase the pressure drop across the device to increase its collection efficiency; (2) blend wastes with very high metals levels with wastes with lower metals levels; and (3) stop accepting those particular wastes with extremely high metals levels.

TABLE 3. ESTIMATED METALS COLLECTION EFFICIENCES OF VARIOUS CONTROL DEVICES

Metal	ESP [a] (percent)	FF [b] (percent)	Venturi scrubber (percent)	Spray tower (percent)
Arsenic	98	99	98	50
Cadmium	99	99	98	93
Chromium	98	99	98	93
Lead	98	99	97	50

[a] Electrostatic precipitator.
[b] Fabric filter.
Source: Engineering-Science, *Background Information Document for the Development of Regulations to Control the Burning of Hazardous Wastes in Boilers and Industrial Furnaces,* Volume 111, February 1987.

V. Proposed Controls for Emissions of Hydrogen Chloride

A. Hazard Posed by Combustion of Highly-Chlorinated Waste

Highly-chlorinated wastes from the manufacturing of organic chemicals and highly-chlorinated spent solvents and solvent recovery distillation bottoms are routinely used as fuels in industrial furnaces and some specially-designed boilers. Chlorine in hazardous waste fuel produces hydrochloric acid (HCl) upon combustion which can have beneficial effects on industrial furnace process chemistry [55] or can allow for efficient recovery of HCl from combustion gases from specially designed boilers.[56] Some industrial boiler operators are also investigating whether the cofiring of hazardous waste fuels containing on the order of 3% chlorine with oil and natural gas in standard boilers will cause accelerated corrosion of boiler parts.

The burning of highly-chlorinated hazardous waste fuel can pose a serious health hazard if the resulting HCl is not controlled by reacting with industrial furnace feedstocks, recovered for use as a by-product, or otherwise removed with flue gas cleaning equipment (e.g., wet scrubbers). Risk assessment using the reasonable, worst-case facilities discussed previously indicates that hazardous waste chlorine levels as low as 530 ppm could pose exceedances of the HCl reference air concentrations (RACs) (where the device burned 100% hazardous waste with a low heating value and all chlorine in the waste was emitted as HCl). The RAC for annual exposure to HCl is 15 $\mu g/m^3$ 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 (as compared to sulfur oxides) and the pollutant generally should not be transported over long distances in the lower atmosphere. The RAC for 3-minute exposures is 150 $\mu g/m^3$. Both RACs will be identified in the Risk Assessment Guideline (RAG).

We note that there is the remote possibility that a chlorinated waste may not have sufficient available hydrogen (i.e., from other hydrocarbon compounds or water vapor) to react with all of the chlorine in the waste. In this case, there is the potential for emission of free chlorine which has toxic properties. Although this issue could be addressed by the permit writer under the omnibus

[55] Chlorine-bearing materials are sometimes charged to cement kilns to neutralize the highly alkaline conditions in the kiln. Hazardous waste fuel containing 3 to 5% chlorine has thus been used for the dual purpose of providing heat and chlorine for the neutralization reactions. Hazardous waste fuels with similar chlorine levels have also been fired in blast furnaces for both their heating value and the beneficial effect of the chlorine (the chlorine is believed to improve the flow of the blast furnace charge down through the furnace by minimizing charge "hangups.")

[56] Dow Chemical Company uses modified boilers for the dual purpose of recovering energy and producing HCl (by scrubbing combustion gases) from highly-chlorinated process streams (e.g., 45% chlorine).

authority of HSWA section 3005(c), we specifically request comment on the extent to which this phenomenon may occur and whether explicit standards for emissions of free chlorine should be provided.

B. Basis for the Standards

EPA is proposing to regulate HCl under the same risk-based regulatory structure proposed for metals and for the same reasons. As with the metals, there are two groups of standards; one for complex terrain, and the other for flat terrain. Each group is broken up into categories based on the effect of ambient air concentration from each device. The limits for HCl are based on short term modeling for the 150 $\mu g/m^3$, 3-minute RAC level since short-term exposure rather than annual exposure is the limiting factor.

The HCl limits in flat terrain consist of four categories. The first category consists of sulfur recovery furnaces and halogen acid furnaces. Category 2 consists of blast furnaces and asphalt plants (limits based on blast furnaces). Category 3 consists of light-weight aggregate kilns, boilers, and lime kilns. The limits for Category 3 are based on light-weight aggregate kilns since this is the worst case for this category. Finally, Category 4 consists of the cement kilns.

The HCl limits for complex terrain consist of three categories. The first is blast furnaces. Category 2 consists of the majority of devices, and includes sulfur recovery furnaces, light-weight aggregate kilns, asphalt kilns, halogen acid furnaces, and lime kilns. Sulfur recovery furnaces are the basis of limits for this category. Category 3 consists of the cement kilns.

There is also a Tier IV standard for all devices (see proposed 266.34-4(c)(1-4)) which allows site-specific dispersion modeling to demonstrate that HCl emissions do not exceed the RACs. Although the equation for computing the allowable chlorine concentration in hazardous waste under the Tier II standards is somewhat different from the Tier II approach proposed for metals, the principle is the same. The feed rate of chlorine from hazardous waste, other fuels, and industrial furnace feedstock (for Tiers I and II) is back-calculated from the Tier III emission limits.

We note that the Tier IV standard requires compliance with both the maximum annual average and the maximum 3-minute RACs, whereas the Tier I-III standards are based solely on the 3-minute RAC. This is because the 3-minute RAC is more stringent in the modeling used to support the Tier I-III standards, but cannot be assumed to be more stringent under the Tier IV standard that requires site-specific modeling.

We also note that there are no Tier I or Tier II standards for halogen acid furnaces since these devices, by definition, burn wastes with very high halogen levels. Halogen acid furnaces would, therefore, comply with Tier III or Tier IV standards.

VI. Nontechnical Requirements

In addition to the technical stack emission standards discussed above, EPA is also proposing to apply the nontechnical standards applicable to other hazardous waste treatment, storage, and disposal facilities to boilers and industrial furnaces burning hazardous waste. These nontechnical standards address the potential hazards from spills, fires, explosives, and unintended egress: require compliance with the manifest system to complete the cradle to grave tracking system; ensure that hazardous wastes (and hazardous residues) are removed from the site upon closure; and ensure that the owners and operators are financially capable of complying with the standards.

The nontechnical standards that would apply under today's rule to boilers and industrial furnaces burning hazardous waste are identical to those that currently apply to hazardous waste incineration facilities. The Part 264 permit standards applicable to incinerators would apply to permitted boilers and industrial furnaces and the Part 265 standards applicable to incinerators would apply to boilers and industrial furnaces in interim status. Those standards are prescribed in proposed § 266.34-1(c) for permitted facilities and § 266.35-1(d) for interim status facilities.

VII. Proposed Exemption of Small Quantity On-Site Burners

Section 3004(q)(2)(B) of RCRA provides EPA with explicit authority to exempt from regulation facilities which burn *de minimis* quantities of their own hazardous wastes. The Administrator is to ensure that such waste fuels are burned in devices designed and operated in a manner sufficient to ensure adequate destruction and removal to protect human health and the environment. The Agency has carefully evaluated the risks posed by small quantity burning, and concluded that a conditional exemption for small quantity burners should be allowed because an exemption can be structured to exempt facilities whose practices pose insignificant risk. The scope of the exemption, rationale for the exemption, and a brief description of the methods used to develop eligibility conditions are discussed below.

A. Scope

Burner eligibility for the exemption will be determined by two principal factors: device size and the quantity of waste burned per month. The Agency is proposing to set different volume cut-offs for different device sizes. See proposed § 266.34-1(b). These volumes were calculated using a series of conservative assumptions about device location, waste composition, and destruction efficiency of organic constituents. These volumes, if burned, are expected to pose insignificant health risks. While the Agency recognizes that calculations based on less conservative assumptions would result in much larger volume estimates, EPA believes that the variation within burning practices justifies the use of the selected assumptions—especially since eligible burners will be exempt from all of the permitting standards otherwise applicable to waste-as-fuel activities. The only requirements that would apply to such small quantity burners are that they notify EPA within 30 days of final promulgation of this rule that they are burning small quantities of hazardous waste and that they keep records to demonstrate conformance with the quantity and firing rate limits.

With two exceptions discussed below, any device regulated by these standards burning hazardous waste fuel at a rate lower than the applicable volume cut-off is eligible for the *de minimis* burner exemption from permitting standards. This exemption is intended to apply to any boiler, including residential, institutional, commercial, industrial and utility boilers. The exemption also applies to all blast furnaces, asphalt kilns, lime kilns, sulfur recovery furnaces, light-weight aggregate kilns, and cement kilns burning hazardous wastes.[57] The Agency has performed conservative evaluations of the potential risks posed by these small quantity burners, and has determined that no regulatory controls (other than notification and recordkeeping requirements and a limit on the maximum firing rate) are necessary to ensure protection of human health and the environment.

For the most part, the exemption would be limited to the types of

[57] Other industrial furnaces are not eligible for the exemption because they were not included in the risk assessment developed to support this provision. We specifically request information on the burning of small quantities of hazardous waste in other industrial furnaces.

situations described in the statutory provisions. Thus, only burners who burn hazardous waste fuels they generate on-site would be eligible for the exemption.[58] Although wastes generated off-site may not pose greater risks when burned than those generated on-site, as a practical matter, burners accepting waste from off-site are not likely to be able to meet the *de minimis* quantity limits. In addition, facilities which burn *de minimis* quantities of hazardous wastes must notify EPA that they are burning hazardous wastes and maintain records of the waste quantities burned. Also, in order to ensure that large quantities of wastes are not burned within a short period of time that could result in lower destruction efficiencies than assumed in the analysis (e.g., lower than 99%), exempt burning would be conditioned on a limit on the waste burning rate. Hazardous wastes could not be fired at greater than 1 percent of the boiler firing rate at any point in time. Thus, the rule would require that burners keep records to document that they are not exceeding the 1 percent firing rate limit.

Boilers and furnaces burning hazardous waste fuels containing or derived from any of the following acute hazardous wastes are not eligible for the exemption: EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027. Given the toxicity of these wastes, EPA does not believe it is appropriate to exempt them from regulation. Hazardous waste fuels containing or derived from these acutely hazardous wastes must be burned at a 99.9999 percent destruction and removal efficiency (DRE) under today's proposed rules. We cannot expect boilers and furnaces to achieve that level of DRE when operating outside of the Agency's regulatory system.

Finally, there are limits on the number of sources allowed under this exemption due to the limitations of the risk analysis as discussed below. In addition, no more than one type of device may burn waste under this exemption at a given site.

[58] Boilers and furnaces that burn their own hazardous waste fuels as well as hazardous waste fuels generated by small quantity generators and exempt from regulation under 40 CFR 261.5 are eligible for the proposed small quantity burner exemption because such small quantity generator hazardous waste fuels are exempt from these proposed rules. Those exempt small quantity generator hazardous waste fuels must, however, be counted in the small quantity burner volume determination because the volume limits are risk-based. When larger volumes of hazardous waste fuels are burned outside of today's proposed controls, the risk could be significant, irrespective of the source of generation of the waste.

B. Rationale

The Regulatory Impact Analysis (RIA) developed in support of this rule[59] indicates that a large number of devices, especially boilers, burn very small quantities of hazardous waste fuel—approximately 25 percent of all burners (250 devices) burn less than 50 gallons per month. The RIA concludes that it would not be cost-effective for these devices to comply with the proposed controls since alternative management practices would be less expensive. The RIA also concludes that the risks posed by these devices are insignificant. Thus, the proposed small quantity exemption is designed to avoid disturbance of a common waste recycling practice which the Agency recognizes as protective of human health and the environment.

C. Basis for Selecting Quantity Limits

A detailed description of the methodology used to calculate volume cut-offs for the exemption is available for public review and comment.[60] A summary of the methodology is presented here for the reader's convenience.

EPA evaluated the risks posed by emissions of organic compounds, metals, and hydrogen chloride, the parameters controlled in the substantive regulations. The analysis demonstrates that the risks posed by organic emissions from waste-as-fuel activities are overwhelmingly dominated by the risks posed by carcinogenic (as opposed to noncarcinogenic) waste constituents. Accordingly, the initial evaluation performed in support of the *de minimis* exemption focused exclusively on carcinogenic risks, on the assumption that controls ensuring insignificant risks from organic carcinogens will ensure protection against non-carcinogenic releases. This assumption was confirmed by evaluating the potential risks from metals and hydrogen chloride which could result when those quantities of waste indicated by the risk analysis for organic carcinogens were burned.

The risks from burning small quantities of hazardous waste in boilers are determined primarily by the following factors:

- Composition of the waste stream being burned;
- Toxicity and concentration of hazardous constituents in the waste stream;
- Destruction efficiency achieved by the device;
- Local meteorology, which determines the amount of dispersion of stack emissions;
- Clustering and size of sources, i.e., number of boilers at a specific location.
- The type of device in which the waste is being burned.

[59] Industrial Economics Incorporated, *Regulatory Analysis for Waste as Fuel Technical Standards*, October 1986 and addendum, January 1987.

[60] Versar Inc., *Analysis for Calculating a De Minimis Risk Exemption for Burning Small Quantities of Wastes in Boilers and Industrial Furnaces*, January 1987.

The values of these parameters can and do vary widely. Therefore, in order to perform the risk analysis, the Agency duplicated a hypothetical situation which would be considered a reasonable, worst-case scenario. This methodology was used to calculate the volume cutoffs for the various boiler sizes which would result in less than a 1 in 100,000 risk of cancer to an individual residing for 70 years at the ground level point of maximum exposure to reasonable, worst-case stack emissions. Separate calculations were made for each of the device sizes evaluated, resulting in differing quantity limits for each device size. The rationale for the assumptions used in the risk analysis is discussed below.

1. *Composition of hazardous waste stream.* Composition data on hazardous waste-derived fuels is scarce. Information gathered by the mail questionnaire survey and other industry contacts indicates that most of the materials burned are organic solvents that are usually classified as hazardous based on ignitability plus toxicity. In addition, analysis of past tests and ongoing studies indicate that the burning of most hazardous wastes may show risks which are very similar to the risks of burning fossil fuels. The actual concentrations of carcinogens in wastes burned by 21 facilities during EPA's field testing program for boilers and industrial furnaces ranged from zero to 17 percent with an average of approximately 4 percent. For the purposes of this risk assessment, the waste streams were assumed to contain 50 percent carcinogenic compounds.

2. *Toxicity of hazardous constituents.* In addition to assuming that the waste stream contained 50 percent carcinogenic compounds, we assumed that the carcinogens had a potency equivalent to a Q^* (slope of the dose response relationship) of 1. This potency is comparable to the potency of PCBs, DDT, chlordane, and toxaphene. Further, the assumed potency of the carcinogenic compounds is 15 times greater than the average potency of the carcinogens found in the wastes at the 21 field test facilities.

3. *Destruction efficiency.* The burner destruction efficiency determines the quantity of unburned hazardous wastes which will be emitted from the stack. Assumed values for boiler and furnace performance were selected based upon a review of test data generated in support of this rule and based on the professional judgment of Agency staff familiar with the destruction and removal efficiencies (DRE) typically achieved by boilers. It was assumed that, in the worst-case, boilers and furnaces would only achieve 99 percent DRE of organic constituents. This represents a very poorly performing combustion device. In fact, as explained previously, most boilers and furnaces can be expected to achieve 99.99 percent DRE of organic waste constituents even when operated under less than optimal conditions.

In addition to the incomplete combustion of the organic hazardous waste constituents (POHCs), there are also products of incomplete combustion (PICs) present in the emissions from burning hazardous wastes (and any other fuel). These PICs can make a significant contribution with respect to the risks from a source. A PIC to POHC ratio of 5.0 was selected for the risk analysis based on a review of test data for the unsteady state tests discussed previously. The carcinogenic potency assumed for PICs is the same as that assumed for the incompletely burned hazardous waste or POHCs (Q Star=1.0). This is considered a very conservative assumption.

4. *Clustering and size of sources.* The size of the sources and the number of emission points which exist at a location have a major impact on ambient air concentrations of the various constituents from stack emissions. The Agency's mail questionnaire survey of boilers burning hazardous wastes shows that more than two-thirds of the boilers are located on sites which have more than one boiler burning hazardous wastes. Therefore, for the purposes of this analysis, a site was assumed to have two boilers. In addition, for the reasonable, worst-case scenario, it was assumed that there would be two facilities adjacent to each other. Finally, to simplify the modeling analysis, the conservative assumption was made that all four boilers were emitting at a single point. This conservatism was further reinforced by the assumption that the sources were simultaneously burning hazardous wastes. Various sizes of boilers were modeled using typical physical characteristics (e.g., stack height, flue gas rates and temperatures). The descriptions of the devices modeled are provided in the support document for this provision: Versar Inc., *Analysis for Calculating De Minimis Risk Exemption for Burning Small Quantities of Hazardous Waste in Boilers and Industrial Furnaces.* January 1987. As a result of this limitation in the risk analysis, the number of boilers burning hazardous wastes under the small quantity burner exception is limited to two per site. The quantity limit for each would apply according to its size (i.e., one boiler could not burn the quantity allocated to both). The EPA requests comments on whether this limitation is reasonable and, if not, what method of apportionment should be used for sites with more than two boilers burning hazardous wastes under this exemption.

For the industrial furnaces a similar analysis was made to determine the clustering of furnaces at a location. As a result of this review, it was determined that the following worst case clustering would be used:

Blast Furnaces—2
Asphalt Kilns—1
Sulfur Recovery Furnaces—4
Light Weight Aggregate Kilns—3
Lime Kilns—2
Wet Cement Plants—3
Dry Cement Plants—3

As a result of this analysis, the number of furnaces burning hazardous waste under this exemption is limited to that on the above list. In addition, only one type of device may burn hazardous wastes under this exemption. This is because the risk analysis supporting the exemption did not take into account mixed categories or types of devices at a site. As with boilers, the EPA requests comments on whether this limitation is reasonable and, if not, what method of apportionment should be used for sites with more furnaces burning hazardous wastes under this exemption than is allowed on the above list.

5. *Dispersion.* For purposes of the reasonable, worst-case analysis, EPA assumed that the devices were located in areas of complex terrain, and used appropriate dispersion models (the same used to develop the Tier I–III values for complex terrain) to evaluate pollutant dispersion. The assumption of complex terrain is generally conservative since it is the situation generally leading to the least dispersion.[61]

[61] We note that the devices were also modeled assuming they were located in flat terrain. In some cases, the flat terrain modeling resulted in poorer dispersion than the complex terrain modeling because of unusual meteorologic or stack tip downwash conditions. The modeling that resulted in the poorer dispersion was used to establish these quantity limits.

6. *Assumptions regarding metals and chlorine in waste fuels.* A similar reasonable, worst case analysis was performed to evaluate the potential risks posed by emissions of toxic metals (including carcinogens) and hydrogen chloride from *de minimis* burners. As a result, it was determined that, at the volume cut-offs specified by the exemption, metals emissions caused by cofiring of hazardous wastes containing metals at the 90th percentile level (see Table 1) would not pose a significant risk. The analysis also considered hydrogen chloride emissions and assumed a chlorine content of 50 percent in the hazardous waste fuel. The chlorine content in actual hazardous wastes seldom exceeds 3 percent: however, the highest chlorine content measured in a hazardous waste fuel fired in a boiler of which EPA is aware was 43 percent. Predicted ground level concentrations of HCl also did not exceed the reference air concentrations.

D. Exemption of Associated Storage

Hazardous waste fuel storage practices prior to burning vary from site to site. Many facilities burning relatively large quantities of hazardous waste fuels hold the fuels in a storage system and then pump the waste fuels through a dedicated line into the combustion zone of the boiler. Other facilities mix hazardous waste fuels with other fuels (typically virgin fuel oil) in a storage/mixing tank prior to burning the blended material. These tanks are not feasibly emptied of hazardous waste every 90 days and so are in most cases ineligible for the generator accumulation provisions in § 262.34.

Under the rule being proposed today, facilities storing unmixed hazardous waste fuels would be responsible for complying with all applicable standards for the storage of the hazardous waste fuel. Owners and operators that are eligible for the small quantity burner exemption and who mix toxic hazardous waste fuels with other fuels would, however, be exempt from the storage standards after such mixing. The basis for this exemption is discussed below.

The Agency is proposing an exemption for storage of such storage/mixing tanks (for small quantity burners) in order for the *de minimis* exemption in Section 3004(q)(2)(B) to have practical application. Congress evidently envisioned a class of facilities capable of burning small amounts of hazardous wastes safely absent regulation, and viewed such burning as a superior means of managing these small amounts of waste. Furthermore, assuming that *de minimis* quantity waste storage is conducted safely, the Agency assumes that Congress also envisioned exemption of the storage since permitting storage would discourage safe on-site burning just as much as regulating the burning itself.

We believe that storage of *de minimis* amounts of hazardous wastes mixed with virgin fuels would pose no significant incremental risks over storage of virgin fuels. The monthly volumes of hazardous waste fuel covered by the *de minimis* exemption, for example, represent less than 0.1 percent of the fuel flow rate through these tanks. Under these circumstances, we think the statutory exemption can reasonably be read to encompass this limited class of storage practices as well.

We note further that the Agency is studying systematically other situations where hazardous waste containing mixtures may not be appropriately subject to regulation, and intends to issue comprehensive rules addressing the issue generically. It appears to us justifiable to address the question for the limited class of burning facilities in advance of other types of situations because Congress has singled out small quantity burning facilities for exemption where appropriate. We note further that to the extent these *de minimis* waste-virgin fuel tanks are underground storage tanks (as defined in section 9001(1)), they would be subject to regulation under Subtitle I because they contain petroleum.

VIII. Regulation of Combustion Residuals

Residuals generated by the combustion of hazardous waste in boilers and individual furnaces include bottom ash, fly ash (collected particulates), scrubber water and blast furnace slag. As discussed below, although most residuals are exempt from regulation, some are subject to regulation either by virtue of the "derived-from" rule of § 261.3(c)(2) (i.e., residues generated by the treatment of listed hazardous waste remain hazardous waste until delisted) or because they exhibit a characteristic of hazardous waste identified in Subpart C of Part 261.

We are not proposing today to revise the regulation of combustion residuals. We are, however, proposing an interpretation of how residuals would be regulated when generated by industrial furnaces involving extraction, beneficiation, and processing of ores and minerals (and cement kilns). The following discussion summarizes the current situation and the basis for the proposed interpretation.

A. Residuals from Boilers

Residuals generated primarily by the combustion of fossil fuels are not RCRA hazardous waste. See § 261.4(b)(4). As discussed at 50 FR 49190 (November 29, 1985), the Agency has interpreted this exclusion to apply to boilers cofiring hazardous waste with fossil fuel as follows: (1) residuals are exempt if the hazardous waste is cofired with coal and the coal provides at least 50% of the boiler's fuel requirement on a volume or heat input basis, whichever results in the larger volume of coal; and (2) residuals are not exempt if the hazardous waste is cofired with oil or gas, or with coal where the coal provides less than 50% of the boiler's fuel requirements. The Agency has taken this approach because when hazardous waste is cofired with large volumes of coal, any contaminants from the hazardous waste would be largely diluted by coal ash. This may not be the case with oil or gas combustion given low volumes of ash generally produced by combustion of these fuels.

Residuals that are not exempt are hazardous waste if the hazardous waste burned contains (or is derived from) a listed hazardous waste, or if the residual exhibits a characteristic of hazardous waste. If the residual is hazardous by virtue of the "derived-from" rule, an owner or operator can petition the Administrator under provisions of § 260.20 to demonstrate that the residual no longer meets the criteria for listing and should be "delisted."

After considering the limited data available on the carryover of constituents from the hazardous waste to the residuals,[62] the Agency is not proposing to change the interpretation discussed above. The Agency, however, specifically requests data on the organic constituents of boiler residuals attributable to burning hazardous waste.

B. Residuals from industrial furnaces

The residuals from most industrial furnaces involved in burning hazardous waste are not RCRA hazardous waste. Residuals from blast furnaces, primary smelting furnaces, light-weight aggregate kilns, and lime kilns are exempt under the exemption provided by § 261.4(b)(7) for solid waste generated by the beneficiation and processing of ores and minerals. Cement kiln dust waste is exempt under § 261.4(b)(8).

These regulatory provisions implement RCRA section 3001(b)(3)(A)(ii)–(iii). These provisions exclude from Subtitle C regulation wastes from certain processes, namely from the extraction, beneficiation, and processing of ores and minerals, and from cement kilns. In evaluating the burning processes that are encompassed by the exclusion, the natural focus of inquiry is on the materials processed in the industrial furnace: are they ores or minerals (e.g., limestone, shale)? If not, what are the percentages of other materials (i.e., nonores or nonminerals such as solid or hazardous wastes) burned, and are they sufficient to indicate that the furnace is essentially engaged in a different type of process? Put another way, the ultimate question is whether the industrial furnace is engaged in a process whose wastes are excluded from regulation, and the question is answered by examining the types and proportions of materials actually being processed.

Under this logic, the Agency views these statutory provisions as applying in the following ways when an industrial furnace processing an ore or mineral or generating cement kiln dust waste also burns a hazardous waste. First, if the device is burning the hazardous waste solely for energy recovery, the Agency in all cases considers the residues to be from processing an ore or mineral (or to be cement kiln dust waste) and hence excluded. This is because the hazardous waste fuels are not being processed directly, in the sense of contributing any material values to the product being produced by the device. Consequently, the device is processing an ore or mineral (or producing cement) and thus generating an excluded waste. In this regard, we note that Congress in section 3004(q) indicated specifically that the new RCRA waste-as-fuel provisions do not affect regulatory determinations under section 3001(b)(3). See also 50 FR 49190 n. 89 (Nov. 29, 1985) noting that these residues remain excluded.

When one of these devices burns a hazardous waste for material recovery, the analysis differs somewhat. This is because the wastes are actually being processed. At some point, therefore, the device would no longer be considered to be processing an ore or mineral if the greater volume of material feed is a hazardous waste (or other secondary material). Thus, if a majority of material feed processed in a device is not an ore or mineral (for cement kilns, limestone or shale), then resulting residues are not deemed to be from processing an ore or mineral (e.g., a cement kiln dust waste). An example would be a smelting furnace which burns secondary materials (rather than ore concentrate)

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[62] Accurex Corp., *Engineering Assessment Reports: Hazardous Waste Cofiring in Industrial Boilers*, August 1984; Accurex Corp., *Hazardous Waste Cofiring in Industrial Boilers Under Nonsteady Operating Conditions*, August 1986.

as the majority of its feedstock. In fact, EPA has consistently taken the position that wastes from secondary smelting do not qualify for the exclusion. See 50 FR 40293 (October 1985).

Finally, we caution that these principles do not apply when a device burns wastes to destroy them, or where destruction is a dominant purpose of burning. Such a device would not be performing the type of process indicated in section 3001(b)(3), but would really be incinerating wastes. (Cf. existing § 264.340(a)(2) which states that industrial furnaces and boilers burning hazardous wastes to destroy them operate as incinerators and are subject to the same standards.) For example, if a cement kiln were to burn hazardous waste fuels in quantities greatly in excess of those needed to fire the kiln, the device could not be deemed to be functioning to produce cement but to destroy hazardous waste, and residues would not be excluded. If a blast furnace or aggregate kiln were to burn large volumes of hazardous waste which did not contribute to the production of iron or aggregate, residues from burning would not be excluded. Relevant factors in making the determination include the revenues derived from burning wastes (either solid or hazardous) versus producing a product, the types and range of wastes burned in the device and what they contribute to the process, and the purpose for which the device is held out to the public.

The Agency solicits comment on these interpretations. If commenters disagree with any point, they are requested to describe particular situations that they believe the Agency's reading fails to accommodate. EPA notes as well that alternative readings of section 3001(b)(3) are possible. One could argue, for example, that Congress contemplated a temporary exclusion for wastes whose character was determined by the processing of an ore or mineral. To the extent an industrial furnace processed wastes along with ores or minerals and these processed wastes determined the character of the resulting waste residues, one thus could maintain that Congress did not intend to exclude the residual wastes. The Agency indeed has expressed this position with regard to wastes from utility boilers cofiring oil or gas and hazardous wastes (50 FR 49190 and n. 87–89 (Nov. 29, 1985) citing 1981 correspondence between the Director of the Office of Solid Waste and the Utility Solid Waste Activities Group), where we reasoned that resulting fly ash would reflect the nonfossil fuel component burned in the boiler. Applied to an industrial furnace, if furnace residues exhibited a hazardous waste characteristic when processing non-ore or mineral feed, but did not when processing only ores and minerals, those residues could be considered to be non-exempt hazardous wastes. Although this reading may reflect the literal statutory language less well than the one given above, we solicit comment on this possible approach. Commenters likewise are requested to describe particular situations whenever possible.

Part Four: Interim Status Standards and Permit Procedures

This part describes the procedures for issuing permits for facilities that operate in conformance with the proposed controls discussed in Part Three. This part also describes standards that would apply to existing facilities until they are closed or a permit is issued.

I. Interim Status Standards

Interim status standards apply to owners and operators of boilers and industrial furnaces burning hazardous waste on or before the effective date of these standards. Such boilers or industrial furnaces are referred to as being "in existence." A boiler or industrial furnace is also considered to be in existence if it is under construction that would enable it to burn hazardous waste on or before the effective date of these standards. A facility has commenced construction if it meets the conditions provided by paragraphs (1) and (2) of the definition of "Existing hazardous waste management (HWM) facility" in 40 CFR 260.10 and 270.2. Those conditions require that all permits necessary to begin physical construction be obtained, and that either continuous physical construction be underway or that the owner or operator be under contractual obligations for physical construction that cannot be cancelled or modified without substantial loss. We also note that, if the facility already has other units which have interim status, § 270.70(c)(2) allows addition of new treatment processes (e.g., a boiler existing at a storage facility) where necessary to comply with new Federal regulations. Under existing rules, however, such changes shall not amount to reconstruction of the facility. See § 270.70(e). EPA is proposing to amend the rules to state that this reconstruction ban does not apply to situations where changes in interim status are needed to comply with new Federal rules. EPA, thus, intends that the reconstruction ban not apply where boilers and industrial furnaces operate at existing interim status facilities.

Interim status standards apply to existing facilities until they are closed under the provisions of those standards or until a permit is issued.

EPA is proposing to apply the following standards to boilers and industrial furnaced burning hazardous waste during interim status: (1) General (nontechnical) facility standards; (2) operating requirements, including metals and hydrogen chloride standards and carbon monoxide limits; (3) monitoring and inspection requirements; (4) waste analysis and closure requirements; and (5) prohibition on burning dioxin-containing waste. The basis for these provisions is discussed below.

A. General Facility Standards

EPA is proposing to apply the existing nontechnical interim status standards applicable to hazardous waste incinerators and other storage, treatment, and disposal facilities to boilers and industrial furnaces. Those standards are necessary to ensure that general facility operations are conducted in a safe manner by technically and financially competent owners and operators. The standards are codified in Subparts A, B, C, D, E, G, and H of Part 265 and address nontechnical aspects of safe operations such as facility security; inspections; personnel training; emergency equipment, plans, and procedures; use of the manifest system; closure; and financial responsibility requirements. The standards in those subparts relevant to combustion devices are incorporated by reference in today's proposed rule in § 266.35–1(d).

B. Operating Requirements

EPA is proposing that two substantive standards apply during interim status: (1) metals and hydrogen chloride controls; and (2) flue gas carbon monoxide limits. The basis for these requirements is discussed below.

1. *Metals and hydrogen chloride standards.* To minimize the effects of metals and hydrogen chloride emissions on affected populations, these proposed regulations would require facilities under interim status to meet the standards set forth in § 266.34–4(3) (b) and (c). The facility may meet any one of the Tier I–III standards. But the facility must meet the chosen standard within 12 months of final promulgation of this rule. (The Agency believes that it is reasonable to allow 12 months for compliance with the metals and hydrogen chloride (and CO) standards given that significant physical modification (e.g., improvements to emissions control devices) may be required.) In addition, the owner or operator of a facility may apply for risk-

based standards under Tier IV. However, if a permit applicant chooses this route, he must submit his Part B application along with the risk assessment for his site-specific standards within 6 months of final promulgation of this rule. The approach required for the risk assessment is discussed elsewhere in today's proposal and will be included in the Risk Assessment Guideline. Site specific air dispersion modeling will be required for the Tier IV standard as well as emissions testing, where applicable (i.e., to obtain credit for air pollution control equipment).

The owner or operator must conduct sampling and analysis as necessary and, under Tier IV, emissions testing to show that he is meeting the metals and HCl standards, and maintain such records so as to show his compliance with the standards until a permit is issued.

2. *Carbon monoxide limits.* To ensure that boilers and industrial furnaces burning hazardous waste during interim status operate at high combustion efficiency, we are proposing to require compliance with flue gas carbon monoxide (CO) limits and to prohibit burning hazardous waste during start-up and shut-down. The rationale and basis for these requirements has been discussed in section II.B of Part Three of this preamble. The CO limits applicable to permitted facilities would also apply to interim status facilities within 12 months of promulgation of this rule. Thus, continuous monitoring of CO and oxygen flue gas levels would be required. We believe that limiting CO levels will, in most cases, ensure that the device is achieving 99.99 percent destruction efficiency and is minimizing emissions of incompletely burned hydrocarbons. A 12-month effective date is provided to enable the owner and operator to install and shake-down the CO monitoring/recording equipment.

We are also proposing optional standards for boilers that would be permitted without a trial burn. These standards are discussed in section II-C of Part Three of this preamble and would be codified in proposed § 266.34-6(b)(4) of the permit standards and proposed § 266.35-3(c) of the interim status standards. Not only would boilers operated under these special conditions be permitted without a trial burn to demonstrate conformance with the DRE standard,[63] but permit officials could consider the fact that such boilers are already operating virtually in compliance with these permit standards in setting priorities for permitting interim status facilities. To determine whether boilers are operating in conformance with the optional standards, permit officials can request written certifications from boiler owners and operators submitting Part A permit applications.

The Agency considered whether boilers for which emissions testing would not be required under the permit standards could be deemed automatically to have a permit without complying with the formal permit procedures (e.g., submission of Part A and Part B permit applications; opportunity for public hearings). Boiler owners and operators could avoid emissions testing under today's proposed rules by: (1) Complying with the special operating conditions to ensure conformance with the performance standards for the control of organic emissions; and (2) complying with the metals and chlorine waste specification levels or calculated mass feed rate limits to ensure compliance with the metals and chlorine performance standards. Given that such boilers are already in compliance with the technical permit standards, they would be in "interim status" in name only. If the Agency could be sure that such owners and operators were, in fact, complying with the standards, the formal permitting process would be unnecessary and such facilities could be considered automatically to have a permit.

Although the special operating conditions proposed today in lieu of organic emissions testing have not been developed to make them completely self-implementing, we believe they could be. Unfortunately, however, the Agency does not believe that RCRA provides the statutory authority to waive formal permitting procedures for facilities that would be subject to substantive controls. The Agency interprets RCRA as unambiguously requiring formal permitting of regulated treatment, storage, and disposal facilities. Permits could be waived only when a facility is unconditionally exempt from regulation or exempt with minimal substantive conditions. Corrective action for releases of hazardous constituents from solid waste management units is tied directly to the permitting process as well. Thus, we believe that boilers operating under the proposed standards in lieu of emissions testing require formal permitting because they must comply with substantive controls. (On the other hand, we believe that the proposed conditional exemption for burners of small quantities of hazardous wastes meets the test of minimal substantive controls—and moreover is directly sanctioned by statute. Thus, we believe that an exemption from the permit procedures for small quantity burners is consistent with the intent of HSWA.)

C. Monitoring and Inspections

Like permitted facilities, facilities in interim status would be required to install, operate, and maintain, within 12 months of this rule's promulgation, continuous flue gas monitors for carbon monoxide (CO) and oxygen in accordance with *Guideline for Continuous Monitoring of Carbon Monoxide at Hazardous Waste Incinerators, Appendix D*, PES, January 1987 (Draft Report).

In addition, we are proposing to require other monitoring and inspections virtually identical to that required for interim status incinerators under § 265.347. Existing instruments that relate to combustion and emission control would have to be monitored at least every 15 minutes and appropriate corrections to maintain steady-state combustion conditions and emission control would have to be made immediately. Instruments that relate to combustion and emission control would normally include those measuring hazardous waste feed rate, feed rate of other fuels, feed rate of industrial furnace feedstocks, hazardous waste firing system pressure, scrubber water flow rate and pH, electrostatic precipitator spark rate, and fabric filter pressure drop.

The boiler or industrial furnace and associated equipment (pumps, valves, pipes, etc.) would also have to be subjected to thorough visual inspection at least daily when hazardous waste is burned, for leaks, spills, fugitive emissions, and signs of tampering. It should be noted that some of these associated devices would be "equipment in VHAP (volatile hazardous air pollutant) service" within the meaning of EPA's recent proposal to control air emissions at certain RCRA facilities, 52 FR 3748 (Feb. 5, 1987), and would be controlled by the standards proposed in that rule.

Finally, the emergency hazardous waste feed cutoff system and associated alarms would have to be tested at least weekly when hazardous waste is burned to verify operability, unless the owner or operator has written documentation that weekly inspections will unduly restrict or upset operations and that less

[63] No emissions testing would be required if the metals and chlorine waste specification levels or calculated allowable feed rates were not exceeded. See proposed §§ 266.34-6(c) (2) and (3) and 266.34-6(d) (2) and (3).

frequent inspections will be adequate. At a minimum, however, operational testing would be required at least monthly.

D. Waste Analysis and Closure

In addition to the general waste analysis requirements of § 265.13 and the general closure requirements of §§ 265.111–265.115, all of which would be incorporated in these standards by reference, we are proposing additional requirements specific to burning hazardous waste in boilers and industrial furnaces. These specific requirements are similar to those required for incinerators operating under interim status. See §§ 265.341 and 265.351.

Owners or operators of boilers and industrial furnaces burning hazardous waste would have to analyze the waste sufficiently to determine the type of pollutants that might be emitted. At a minimum, the analyses must determine the concentrations of organic and inorganic compounds (including metals) identified in Appendix VIII that may reasonably be expected to be in the waste, and chlorine in the waste, on an as-fired basis (i.e., either in the waste or after any blending with other wastes or fuels), unless the owner or operator has written, documented data that show that the element is not present. Analyses of these elements would be required either because their emissions would be controlled under the proposed standards or because the permit writer could use the authority of HSWA Section 3005(c) to control emissions as necessary to protect public health and the environment. In addition, the heating value of the waste must be determined to enable the owner and operator to consider how completely the material may burn considering the waste firing rate, firing system, waste/air mixing, combustion gas temperatures, and retention time at those temperatures. Finally, the owner or operator would be required to analyze sufficiently any hazardous waste he has not previously burned in his boiler or industrial furnace to enable him to establish steady-state (normal) operating conditions and to comply with the stack gas carbon monoxide (CO) and metals and HCl standards provided by proposed § 266.35–3.

With respect to closure, the owner or operator would be required to remove all hazardous waste and hazardous waste residues (including, but not limited to, ash, scrubber water, and scrubber sludges) from the boiler or industrial furnace site.

E. Prohibition on Burning Dioxin-Containing Wastes

Hazardous waste containing or derived from any of the following dioxin-containing wastes could not be burned in a boiler or industrial furnace operating under interim status: EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027. Burning these dioxin-containing wastes during interim status is prohibited because boilers and industrial furnaces could not be assumed to achieve the 99.9999 percent DRE (Destruction and Removal Efficiency) required for these wastes to protect human health adequately under the permit standards. The prohibition on burning dioxin-containing wastes would be codified in proposed § 266.35–1(c), and the requirement for permitted facilities to demonstrate 99.9999 percent DRE for these wastes would be codified in proposed § 266.34–4(a)(1)(iii).

F. Exemption of Small Quantity On-Site Burners

The burning of extremely small quantities of hazardous waste (e.g., 7 gallons per month for small boilers and up to 300 gallons per month for large boilers) absent regulatory control (i.e., assuming poor combustion conditions) poses negligible risks. See discussion in Section V of Part Three of this preamble. Therefore, a conditional exemption for burners of small quantities of hazardous waste generated on-site would be codified in proposed § 266.35–1(b)(1) (interim status standards), and § 266.34–1(b)(permit standards). The exemption would be conditioned as follows: (1) The wastes must be generated on-site; (2) the total quantity of waste burned in a calendar month as a function of boiler size and the quantity burned at any point in time must not exceed 1% of boiler feed on a heat or volume input basis; and (3) the waste must not contain or be derived from dioxin-containing wastes.

II. Permit Procedures

Boilers and industrial furnaces burning hazardous waste would be subject to the permit procedures of Part 270 for hazardous waste treatment, storage, and disposal facilities. In particular, existing facilities would be required to submit Part A of the permit application containing the information identified in existing § 270.13 within six months of the effective date of final rules promulgated subsequent to today's proposal. When requested by permit officials, owners and operators of interim status facilities must submit Part B of the permit application. General information on the contents of Part B of the application is provided in existing § 270.14. Specific information for Part B of the application for boilers and industrial furnaces is provided in proposed § 270.22. In addition, information on the special types of permits for boilers and industrial furnaces and trial burn procedures is provided in proposed § 270.65.

New facilities would be required to submit Part A and Part B of the permit application at least 180 days before physical construction is expected to commence. See existing § 270.1(b).

Proposed §§ 270.22 and 270.65 are patterned after the permit procedures for hazardous waste incinerators in §§ 270.19 and 270.62. The proposed sections are discussed below.

A. Proposed § 270.22: Specific Part B Information

Proposed § 270.22 provides specific information requirements for Part B of the permit application. Paragraph (a) requires a trial burn to demonstrate conformance with the performance standards, unless the documentation to support the waiver of a trial burn required in proposed paragraph (c) is provided. Paragraph (b) requires owners and operators required to conduct a trial burn to submit a burn plan or the results of a trial burn in accordance with proposed § 270.65.

Paragraph (c) requires documentation to support a waiver of a trial burn under the following exemptions:

1. *Boilers operated under the special conditions for conformance with the organic emission standard.* When seeking the exemption for a trial burn to demonstrate that the boiler is in conformance with the organic emission standard in proposed § 266.34–4(a), the owner or operator must submit documentation that the boiler operates in conformance with the special conditions provided by proposed § 266.34–6(b)(4).

2. *Waiver of a trial burn to demonstrate conformance with the metals emission standard.* When seeking the exemption for emissions testing to demonstrate conformance with the metals emissions performance standards in proposed § 266.34–4(b), the owner or operator must either: (a) Document by analysis that the hazardous waste itself or, as fired, (i.e., after any blending with other wastes or fuels) does not contain metals at levels higher than allowed in the Tier I metals specification in proposed § 266.34–4(b)(1); or (b) document by analysis of the hazardous waste, other fuels, and industrial furnace feedstocks and by records of operating procedures (for

existing facilities) or by planned operating procedures (for new facilities) that the metals concentrations in the waste will not exceed the Tier II levels allowed by the equations in proposed § 266.34-4(b)(2), considering the metals levels in the hazardous waste itself or, as fired, other fuels, and industrial furnace feedstocks, and the feed rate of the hazardous waste, other fuels, and industrial furnace feedstocks.

If neither the Tier I nor Tier II standards are met for a metal, emission testing to demonstrate conformance with the metals performance standards is required for all metals.

3. *Waiver of a trial burn to demonstrate conformance with the HCl emission standard.* When seeking the exemption for emissions testing to demonstrate conformance with the hydrogen chloride (HCl) emissions performance standard in proposed § 266.34-4(c), the owner or operator must either: (a) Document by analysis that the chlorine content of the hazardous waste itself, or as fired, does not exceed the Tier I level allowed in the chlorine specification in proposed § 266.34-4(c)(1); or (b) document by analysis of the hazardous waste, other fuels, and industrial furnace feedstocks and by records of operating procedures (for existing facilities) or by planned operating procedures (for new facilities) that the allowable Tier II chlorine concentration in the waste computed by the equation in proposed § 266.34-4(c)(2) will not be exceeded, considering the chlorine level in the hazardous waste, as fired, other fuels, and industrial furnace feedstocks, the heating value of the hazardous waste and other fuels, and the feed rate of the hazardous waste, other fuels, and industrial furnace feedstocks.

4. *Data in lieu of a trial burn.* The owner or operator of a boiler or industrial furnace may seek an exemption from the trial burn by providing information from trial or operational burns of similar boilers or industrial furnaces burning similar waste under similar conditions. The Director shall approve a permit application without a trial burn if he finds that the hazardous wastes are sufficiently similar, the devices are sufficiently similar, and the data from other trial burns are adequate to specify (under proposed § 266.34-6) operating conditions that will ensure conformance with the performance standards in proposed § 266.34-4.

The information requirements to support this exemption are patterned after the existing requirements for hazardous waste incinerators submitting data in lieu of a trial burn. See existing § 270.19(c). The requirements for boilers and industrial furnaces would, however, require information on the metals and chlorine levels of materials feed to the devices, and design and operational information on metals and HCl flue gas control equipment to ensure conformance with the proposed metals and HCl emission standards.

B. Proposed § 270.65: Special Forms of Permits

Proposed § 270.65 establishes special forms of permits for new boilers that will be operated under the special conditions for waiver of the trial burn and for all other new boilers and new industrial furnaces where a trial burn is required. This section also establishes trial burn procedures. Finally, this section discusses special procedures for permitting existing facilities. These provisions are discussed below.

1. *Permits for new boilers exempt from the trial burn requirements.* Owners and operators of boilers are exempt from the requirement to conduct a trial burn provided that the boiler operates as follows: (a) the boiler must operate in conformance with the special conditions provided by proposed § 266.34-6(b)(4) to ensure conformance with the performance standard for organic emissions; and (b) the boiler must burn hazardous waste that either meets the Tier I metals and chlorine specification levels of proposed §§ 266.34-4 (b)(1) and (c)(1) or meets the Tier II limits provided by proposed §§ 266.34-4 (b)(2) and (c)(2). These requirements in aggregate are termed "Special Operating Requirements."

Proposed § 270.65(b) establishes the following permits for boilers operated under the Special Operating Requirements: Predemonstration, Demonstration, and Final Permits. A Predemonstration Permit would cover the period beginning with initial introduction of hazardous waste into the boiler and extend for the minimum time required, not to exceed a duration of 720 hours operating time [64] when hazardous waste is burned to bring the boiler to a point of operation readiness to conduct a demonstration that the boiler can operate under the Special Operating Requirements. In practice, the primary purpose of this period is to determine whether the hazardous waste firing system and boiler combustion controls can be operated to achieve flue gas carbon monoxide levels that meet the limits in proposed § 266.34-4(a)(2) and that are incorporated by reference in proposed § 266.34-6(b)(4)(v). During this period, the boiler must be operated in conformance with the Standard Operating Requirements. The Director may extend the period of the Predemonstration Permit once for up to 720 additional hours when good cause for the extension is demonstrated by the applicant. Any such extension would be handled as a minor modification of permits under existing § 270.42.

The Demonstration Permit covers the period immediately after completion of the predemonstration period and extends only for the minimum time sufficient to allow sample analysis, data computation, and submission of the results by the applicant demonstrating conformance with the Standard Operating Requirements. During this period, the boiler must be operated in conformance with the Standard Operating Requirements. The Demonstration Permit is an extension of the Predemonstration Permit and constitutes a minor modification of permits under existing § 270.42.

After successful completion of the demonstration period, the boiler operates under a Final Permit in conformance with the Standard Operating Requirements. In the Final Permit, the Director will specify changes to the limitations, as appropriate, on the metals and chlorine content, heating value, and feed rates of the hazardous waste, other fuels, and industrial furnace feedstocks, and requirements for the operation and maintenance of emission control equipment necessary to ensure compliance with the Standard Operating Requirements. The Final Permit is an extension and modification to the demonstration permit and constitutes a minor modification of permits under existing § 270.42.

2. *Permits for new boilers and industrial furnaces subject to a trial burn.* Proposed § 270.65(c) establishes the following permits for new boilers and industrial furnaces required to conduct a trial burn: Pretrial Burn Permit, Trial Burn Permit, Post-Trial Burn Permit, and Final Permit. A Pretrial Burn Permit would cover the period beginning with initial introduction of hazardous waste into the boiler or industrial furnace and extend for the minimum time required, not to exceed a duration of 720 hours operating time when hazardous waste is burned, to bring the device to a point of operation readiness to conduct a trial burn. The Director may extend duration of this operational period once, for up to 720 additional hours, at the request of the applicant when good cause is shown.

[64] This is the same period of time allowed for start-up and shake-down of hazardous waste incinerators under existing § 270.62(a) prior to conducting a trial burn.

Applicants must submit a statement with Part B of the permit application that suggests the conditions necessary to operate in conformance with the performance standards of proposed § 266.34-4. This statement should include, at a minimum, restrictions on hazardous waste constituents including arsenic, cadmium, chromium, lead, and chlorine, hazardous waste heating value and feed rates, and the operating parameters identified in proposed § 266.34-6. The Director will review this statement and other relevant information and use his engineering judgment to specify requirements for this period sufficient to meet the performance standards of § 266.34-4. A Trial Burn Permit covers the period during the conduct of the trial burn. For the duration of the trial burn, the Director must establish conditions in the permit for the purposes of determining feasibility of compliance with the performance standards of proposed § 266.34-4 and of determining adequate operating conditions under proposed § 266.34-6. The procedures for developing and conducting a trial burn program already in place for hazardous waste incinerators in § 270.62(b) were used as a guide to develop proposed § 270.65(c)(2). The applicant must propose a trial burn plan with Part B of the application that includes: (1) Comprehensive analysis of each hazardous waste, as fired; (2) a detailed engineering description of the boiler or industrial furnace; (3) a detailed description of sampling and monitoring procedures; (4) a detailed test schedule for each hazardous waste for which a trial burn is planned; (5) a detailed test protocol; (6) a description of, and planned operating conditions for, any emission control equipment that will be used; (7) procedures for rapidly stopping the hazardous waste feed and controlling emissions in the event of an equipment malfunction; and (8) such other information as the Director reasonably finds necessary to determine whether to approve the trial burn plan.

The Director will review the trial burn plan and may require the applicant to supplement this information, if necessary.

Based on the hazardous 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. The trial POHCs will be specified by the Director based on his estimate of the difficulty of destruction of constituents in the waste, their concentration or mass in the waste, and for wastes listed in Subpart D of Part 261, the constituents identified in Appendix VII of that part as the basis for listing.

The Director shall approve a trial burn plan if he finds that the trial burn is likely to determine whether the device can meet the performance standards of proposed § 266.34-4, the trial burn itself will not present an imminent health hazard, the trial burn will help him to determine operating requirements to be specified under proposed § 266.34-6, and the operating requirements necessary to ensure conformance with the performance standards cannot reasonably be developed through other means.

The Director shall extend and modify the Pretrial Burn Permit as necessary to accommodate the approved trial burn plan. The permit modification shall proceed as a minor modification according to existing § 270.42.

During each approved trial burn (or as soon after the burn as is practicable), the applicant must make the following determinations: (1) A quantitative analysis of the trial POHCs and arsenic, cadmium, chromium, lead, and chlorine in the hazardous waste; (2) a quantitative analysis of the exhaust gas for the concentration and mass emissions of the trial POHCs; (3) for hazardous waste that is off-specification for arsenic, cadmium, chromium, lead, or chlorine, either a quantitative analysis of the hazardous waste, other fuels, and industrial furnace feedstocks sufficient to demonstrate that the level of the off-specification element in the hazardous waste does not exceed the Tier II limits provided by proposed §§ 266.34-4 (b)(2) or (c)(2), or a quantitative analysis of the exhaust gas for the concentration and mass emission of the regulated metals and HCl, and a computation showing conformance with the Tier III emissions standards in proposed §§ 266.34-4 (b)(3) and (c)(3) or, site-specific dispersion modeling in conformance with the Tier IV procedures provided by proposed §§ 270.22 (d) and (e); (4) 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 and any metal or chlorine for which emissions testing was used to demonstrate conformance with the emission standards; (5) a computation of destruction and removal efficiency; (6) an identification of sources of fugitive emissions and their means of control; (7) a continuous measurement of carbon monoxide and oxygen in the exhaust gas; and (8) such other information as the Director may specify as necessary to develop the operating conditions required by proposed § 266.34-6 to ensure compliance with the performance standards in proposed § 266.34-4.

The applicant must submit to the Director a certification that the approved trial burn program has been carried out and must submit results of the determinations identified above within 90 days of completion of the trial burn, or later if approved by the Director. All data collected during any trial burn must be submitted to the Director following completion of the trial burn. All submissions must be certified on behalf of the applicant by the signature of the person authorized to sign a permit application or a report under § 270.11.

Until the Final Permit based on the trial burn results can be developed, the Director will use his engineering judgment to extend and modify as necessary the Trial Burn Permit to ensure compliance with the performance standards of proposed § 266.34-4. The development of the Post-Trial Burn permit shall proceed as a minor modification according to existing § 270.42. The duration of the Post-Trial Burn Permit will be only for the minimum period sufficient to allow analysis, data computation, and submission of the trial burn results by the applicant, and review of the trial burn results and modification of the permit by the Director to develop the Final Permit that reflects the trial burn results. The modification of the Post-Trial Burn Permit to develop the Final Permit shall also proceed as a minor modification under existing § 270.42.

3. *Permit procedures for interim status facilities.* Applicants owning or operating existing boilers or industrial furnaces would be permitted under proposed § 270.65(d). Applicants owning or operating interim status boilers that are or will be operating under the Special Operating Requirements [65] for which the trial burn is waived must submit with Part B of the permit application documentation that the boiler is operated in accordance with the Special Operating Requirements. The statement must include, at a minimum, the operating record documenting continuous measurement of carbon monoxide and oxygen in the exhaust gas. Further, if the hazardous waste is off-specification for metals or chlorine, the statement must also include limitations, as appropriate, on the metals and chlorine content, heating value, and feed rates of the hazardous

[65] Boilers operated in conformance with proposed §§ 266.34-6(b)(4), 266.34-4(b) (1) or (2), and §§ 266.34-4(c) (1) or (2).

waste, other fuels, and industrial furnace feedstocks to demonstrate conformance with the proposed Tier II standards provided by §§ 266.34-4 (b)(2) and (c)(2).

Applicants owning or operating industrial or boiler furnaces that will be permitted with a trial burn must prepare and submit a trial burn plan and perform a trial burn as discussed above relative to new facilities.

Part Five: Storage Standards, Halogen Acid Furnaces, and Other Issues

I. Storage Standards

A. Standards for Storage Tanks

Under the Administrative Controls for hazardous waste burners and blenders promulgated on November 29, 1985, and codified in Subpart D of Part 266, EPA subjected existing burner storage facilities, newly regulated by that rule, only to the interim status standards of Part 265. See § 266.35(c)(2). The permit standards of Part 264 were not applied to these storage facilities to avoid two-stage permitting given that today's proposed rules for permitting boiler and industrial furnace facilities was under development at that time. The Agency wanted to avoid requiring a boiler or industrial furnace owner or operator to get a permit for this hazardous waste fuel storage facility and to soon thereafter get another permit (under a promulgation of today's rule) for operation of his boiler or industrial furnace.

Today's rule would, therefore, subject such existing burner storage facilities to the permit standards of Part 264.

B. Proposal To Regulate Hazardous Waste Fuel Blending Tanks

EPA recently issued a clarifying notice indicating that the Agency interpreted existing regulations as requiring hazardous waste fuel blending tanks to be covered by RCRA storage standards. We have decided, however, that the rules could be drafted to make this point more clearly and so have included more precise language in today's proposed regulation. The reason for regulating blending tanks is the same as that underlying the present rules: blending tanks pose the same risks as other hazardous waste storage tanks, posing no types of special consideration that might warrant different regulatory standards. It also makes no sense for EPA to regulate hazardous waste fuels cradle-to-grave but not to regulate fuel blending tanks. Such a regulatory gap has no foundation in environmental policy and invites abuse through facilities evading regulation by claiming that their only activities are fuel blending and consequently that no RCRA storage standards (and attendant permitting standards) apply to them. We are thus proposing to amend the hazardous waste fuel regulations to state explicitly that fuel blending tanks are subject to RCRA storage standards. The comment period on this part of today's proposal is 30 days.

We note that since these rules would regulate all hazardous wastes being burned in boilers and industrial furnaces, there no longer would be any need for the hazardous waste fuel marketer classification in the current rules. Such intermediaries would continue to be regulated as hazardous waste storage facilities and be responsible for complying with applicable administrative requirements such as manifest and recordkeeping responsibilities.

II. Proposed Designation of Halogen Acid Furnaces as Industrial Furnaces

The DOW Chemical Company (DOW) filed a rulemaking petition with EPA on March 31, 1986, in accordance with the provisions of 40 CFR 260.20 requesting EPA to designate their halogen acid furnaces (HAFs) as industrial furnaces. EPA is today proposing to grant the petition by classifying as industrial furnaces those HAFs that meet the criteria discussed below.

A. DOW's Petition

We understand from the petition and subsequent communication with DOW [66] that DOW operates about 27 HAFs that are fire-tube boilers modified to produce hydrogen chloride (HCl) from chlorine-bearing secondary streams by scrubbing HCl from combustion gases. The secondary waste streams typically have a chlorine content of 20 to 70 percent and an as-fired heating value of approximately 9,000 Btu/lb. Thus, the secondary streams are highly chlorinated and have substantial heating value.[67] The HAFs are located on the site of DOW's chemical manufacturing operations and the secondary materials burned are generated on-site.

Approximately half of the HAFs produce and export steam and meet EPA's definition of a boiler under § 260.10. Those HAFs that meet the definition of a boiler would be regulated as boilers. The remaining HAFs, although modified fire-tube boilers, do not generate steam and do not meet EPA's definition of a boiler. EPA is proposing to classify the nonboiler HAFs as industrial furnaces for the reasons discussed below.

B. Bases for Classification as an Industrial Furnace

EPA has defined an industrial furnace at § 260.10 as any of the specifically-designated enclosed devices that are integral components of a manufacturing process and that use controlled flame devices to accomplish recovery of materials or energy. Eleven types of devices have been designated as industrial furnaces to date. The definition also provides criteria for adding devices to the list.

EPA believes that DOW's nonboiler HAFs [68] are integral components of a manufacturing process and that they meet two of the criteria for designation as an industrial furnace.

1. *HAFs are integral components of a manufacturing process.* Industrial furnaces normally process raw materials, and, thus, there is no question that they are integral components of a manufacturing process. For the reasons presented below, EPA believes that DOW's HAFs are also integral components of a manufacturing process even though they process secondary streams: (1) The HAFs are located on the site of the manufacturing process (i.e., production of organic chemicals) and the only secondary streams they process are generated by that manufacturing process; (2) the HCl produced is a *bona fide* product because it has a HCl content of 6-20 percent [69]; and (3) the HCl product is used on-site in the manufacturing process.

2. *HAFs recover materials and energy.* EPA believes that DOW's HAFs recover materials and energy. Production of HCl (i.e., a 6-20 percent HCl concentrate solution) from the combustion of chlorine-bearing secondary materials constitutes materials recovery in the context of designation as an industrial furnace. We note, however, that for the purposes of determining the applicability of RCRA regulations to the process, the secondary streams should

[66] Letter from Byron Cary, DOW, to Marcia E. Williams, EPA, dated July 8, 1986; letter from Marcia E. Williams, EPA, to Byron Cary, DOW, dated August 28, 1986.

[67] EPA considers wastes with more than 5,000-8,000 Btu/lb heating value to have substantial heating value and may be legitimately burned for energy recovery in boilers and industrial furnaces. See Section VI of Part Two of this preamble.

[68] For the remainder of this discussion, the term HAF refers to the nonboiler HAFs.

[69] The HCl content of the effluent from wet scrubbers used to control HCl emissions from the incineration of chlorine-bearing waste is normally on the order of 1 percent or less. Such low HCl content scrubber water is not considered a *bona fide* product for purposes of designation as an industrial furnace even if the scrubber water is beneficially used in a manner that specifically relates to its HCl content.

be more precisely considered to be used as an ingredient in the production of the HCl product. The implication of this issue is discussed later in this section.

The HAFs also accomplish energy recovery in the context of determining the applicability of RCRA regulations. The secondary materials are burned partially for energy recovery because substantial, usable heat energy is released by the materials during combustion. The materials typically have an as-fired heating value of approximately 9,000 Btu/lb, and the heat released results in the thermal degradation of chlorinated organic compounds to form HCl. Although energy recovery in a boiler under EPA's definitions is characterized by the recovery and export of energy, energy recovery in an industrial furnace need not involve such recovery and export of energy. Rather, the test for energy recovery in industrial furnaces is based on the burning of materials with substantial heating value (i.e., greater than 5,000 Btu/lb) in a manner that results in the release of substantial usable heat energy. See 50 FR 49171–49174 (November 29, 1985).

3. *HAFs meet industrial furnace criteria.* EPA has established criteria in § 260.10 for designating additional devices as industrial furnaces. Devices can be designated as industrial furnaces on the basis of one or more of the criteria. EPA believes that DOW's HAFs meet two of the criteria as described above (see a and b) and, thus, is proposing to classify them as industrial furnaces.

DOW's HAFs appear to be designed and used primarily to accomplish the recovery of material products. The HAFs are specially designed and operated fire-tube boilers (that are not operated to produce steam). Their design features enable them to accept highly-chlorinated feedstocks without unacceptable corrosion and to maximize HCl production and recovery. DOW has patents on its HAFs as evidence that the HAFs are specially designed and differ from typical incinerators.

The HAFs can also be considered to burn secondary materials as ingredients in an industrial process to make a material product. As discussed above, chlorine-bearing secondary streams from chemical manufacturing operations are burned on-site to produce an HCl product for use in the manufacturing operation.

C. Proposed Designation

EPA is proposing to add a new category of industrial furnaces to read as follows: Halogen Acid Furnaces for the production of acid from halogenated secondary materials generated at chemical production facilities where the furnace is located on-site and the acid product has a halogen acid content of at least 6 percent.

The designation limits the classification to those devices used on-site by a chemical production facility to process its halogenated secondary streams and where the acid product contains at least 6 percent halogen acid to distinguish clearly between industrial furnaces used to produce *bona fide* acid product and incinerators, either off- or on-site, used to destroy halogenated waste and equipped with halogen emissions removal devices. Such emission control devices, such as spray towers and venturi scrubbers, produce halogen acid-bearing scrubber water. The halogen acid content of such scrubber water, however, would be substantially less that the 6 percent proposed minimum achieved by specially designed and operated acid production operations. Thus, such halogenated waste incinerators equipped with wet scrubbers could not meet the proposed definition for the HAFs even if the halogen acid-bearing scrubber water were claimed to be a product.

EPA specifically requests comments on whether the proposed definition of Halogen Acid Furnaces is: (1) Restrictive enough to distinguish clearly between furnaces used for *bona fide* acid production and incinerators equipped with conventional wet scrubbers for acid gas emissions control; and (2) not so restrictive as to preclude *bona fide* acid production operations from being classified as industrial furnaces.

EPA also requests information on the burning in HAFs of wastes to produce halogen acids other than HCl (e.g., HBr), including whether the proposed HAF definition is appropriate for those devices and whether the proposed controls would adequately protect public health and the environment.

D. Regulations Applicable to HAFs

HAFs burn halogenated secondary materials for the production of halogen acids. Thus, the secondary materials are used as an ingredient in an industrial process and would not be a solid waste under the provisions of § 261.2(e)(1)(i) unless: (1) The materials were also burned partially for energy recovery (see § 261.2(e)(2)(ii)); or EPA determines the secondary streams are inherently waste-like and adds the secondary streams to the list of inherently waste-like materials under § 261.2(d) that are solid wastes when recycled in any manner.

As discussed above, DOW's secondary streams are burned partially for energy recovery because the materials have substantial as-fired heating value (9,000 Btu/lb) and substantial, useful energy is released by the combustion of the materials. The energy is used to produce halogen acid from halogenated hydrocarbons. Therefore, DOW's HAFs would be subject to today's proposed rules for industrial furnaces.

In addition, EPA considers DOW's secondary streams to be inherently waste-like and subject to listing under § 261.2(d) as a material that is a solid waste when recycled in any manner or certainly in the manner utilized by DOW. Listed wastes burned in DOW's HAFs include EPA Hazardous Waste Nos. F002, F024, K016, K017, and K020. These wastes not only are typically disposed of, but contain high concentrations of Appendix VIII constituents not normally found in raw materials used in acid production. EPA is, however, not proposing today to list DOW's secondary streams as inherently waste-like under § 261.2(d). Given that the materials are burned partially for energy recovery, the materials are solid waste, and because they are listed or identified under Part 261 as hazardous waste, DOW's HAFs would be subject to today's proposed rules for industrial furnaces. Thus, there is no need to undertake a designation under § 261.2(d) at this time.

III. Proposed Classification of Coke and By-Product Coal Tar Containing Tar Decanter Sludge (EPA Hazardous Waste K087) as a Product

A. AISI Petition

The American Iron and Steel Institute (AISI) has petitioned the EPA with respect to the practice of recycling tar decanter sludge by the following means:

1. Applying the sludge to coal prior to or just after charging the coal into the coke oven and;

2. Combining the sludge with coal tar prior to its being sold.

The coke and the coal tar are often used as fuel and so are presently classified as solid wastes and hazardous wastes since they are fuels produced or otherwise containing hazardous waste—EPA Hazardous Waste No. K087, tar decanter sludge. See § 261.2(c)(2)(i)(B). These hazardous waste fuels presently are exempt from regulation § 261.6(a)(2)(vii) and 50 FR 49170–171 (Nov. 29, 1985). The AISI has requested that EPA not classify such coke or coal tar as solid wastes. AISI submits that recycling the decanter sludge does not significantly affect the concentration of toxic metal and organic constituents of the coke or coal tar. EPA has indicated that waste-derived fuels could be classified as products under such circumstances, "since the more waste-derived fuels from a process are like products from the same process produced by virgin materials, the less likely EPA is to classify the waste-derived fuel as a waste." 50 FR 49169 (Nov. 29, 1985). To support its request, the AISI has submitted data on the metals and organic constituents in coke, coal tar, and tar decanter sludge both with and without sludge recycling.

B. Process Description

Coke used for making iron is manufactured through the destructive distillation of coal in ovens. A typical oven holds approximately 13 tons of coal which is heated to a temperature of about 2000 °F. Generally 20 to 100 ovens are located adjacent to each other in a "coke oven battery." The destructive distillation or "coking" process takes about 15–18 hours. During that time period, about 20–35 percent of the coal is converted to coke oven gas (COG) consisting of water vapor, tar, light oils, heavy hydrocarbons, and other chemical compounds. The COG is collected from the top of the coke oven and, in most cases, sent to the by-product plant via the coke battery main. The COG is then cleaned by removing wastes and by-products prior to being burned, generally in the coke oven under-firing system. As a first step in the COG cleaning process, the coal tars, consisting of heavy hydrocarbons, are condensed from the gas. In addition, most of the particulates that escape from the ovens is collected in the tar. These particulates are believed to consist principally of coal fines. The particulates or solids are then removed from the tar in the tar decanter. The coal tar is then burned as fuel or sold for use in various products such as roofing cement. The sludge has been listed as EPA Hazardous Waste No. K087 and is either disposed of or recycled either by mixing with the coal prior to being charged to the coke oven or mixing directly with the coal tar after physical processing (grinding) prior to sale.

Approximately 8–12 gallons [70] of tar is produced per ton of coke. In addition, approximately one pound of tar decanter sludge is produced for every 40 pounds of tar produced.

[70] *The Making, Shaping, and Treating of Steel*, 10th Edition, Association of Iron and Steel Engineers, 1985.

C. Basis for Proposed Approval of the AISI Petition

The AISI has submitted data on metals and organic chemical analysis for the coke, coal tar, and tar decanter sludge for four plants.[71] Specifically, the data included analyses for the following constituents:

Metals	*Organic Constituents*
Arsenic	Anthracene and Phenanthrene
Cadmium	Benzo(a)anthracene and Chrysene
Chromium	Benzo(a)pyrene
Mercury	Fluoranthene
	Pyrene
	Napthalene
	Phenol

The results of 34 samples were submitted by AISI. The Agency reviewed these results and determined the following:

1. The recycle of the tar decanter sludge by application to the coal charge does not appear to have a significant effect on the chemical make-up of coke.
2. The organic chemical make-up of the tar decanter sludge does not appear to be significantly different from the coal tar.
3. The concentration of one metal, lead, in the sludge appears to be slightly higher than in the coal tar. The increase does not appear to be statistically significant, however, due to the high variability of the concentration values.

Based on the above and the fact that there is such a small quantity of sludge relative to the quality of coke and coal tar produced by the coking process, EPA believes that sludge recycling as described here does not significantly affect the concentration of toxic metals and organic constituents in coal tar or coke. Furthermore, coke, coal tar, and the decanter tank tar sludge arise from a single process, are similar materials, and contain the same contaminants. Therefore, EPA is proposing that these materials be classified as products, not wastes. We note that only the waste-derived fuels would be excluded from jurisdiction; the decanter tank tar sludge would remain a regulated hazardous waste prior to combining with coke or coal tar. See 50 FR 49171 (Nov. 29, 1985).

IV. Notice of Intent to Amend the Subpart O Incinerator Standards

Today's proposed rules for boilers and industrial furnaces burning hazardous waste would be more comprehensive than the current Subpart O standards for hazardous waste incinerators. First, the proposed CO limits would ensure that devices continuously operate at high combustion efficiencies when burning hazardous waste. Thus, this would help ensure the devices achieve high destructive efficiencies of organic compounds with minimal PIC (products of incomplete combustion) emissions over the life of the permit. CO limits for incinerators, however, are currently based on levels achieved during the trial burn. Given that field tests demonstrate that boilers can achieve 99.99% DRE during upset condition as evidenced by high CO levels and smoke emissions, incinerator CO limits may be set at levels that in some cases represent upset conditions. Incinerators operated at elevated CO levels may emit higher levels of PICs than they would if operated at levels representative of high combustion efficiency. Thus, EPA intends to propose to amend the Subpart O standards to prescribe CO limits applicable during the life of the permit and to require that conformance with the limits be demonstrated during the trial burn.

Second, today's rule proposes risk-based metals emissions limits. Metals emissions from incinerators are currently controlled with a technology-based and outdated particulate standard developed for municipal solid waste combustors.[72] That standard, 0.08 grains/standard cubic foot, may not, in certain situations, be fully protective with respect to metals emissions. Therefore, the Agency is considering whether additional particulate controls or controls on individual metals are needed to make the standards fully protective.

Finally, today's rule also proposes a risk-based emission limit for HCl. HCl emissions from incinerators are controlled with a technology-based standard that limits HCl emissions to 4 lb/hr unless the emissions are controlled with a device having at least a 99% HCl removal efficiency. That standard may over-regulate some situations (e.g., large incinerators with tall stacks) and under-regulate others. Therefore, the Agency is considering whether a risk based standard should be developed for incinerators to ensure that fully protective and cost-effective controls are applied.

The Agency plans to propose amendments to the Subpart O standards as necessary in Fall 1987. The final rule

[71] Correspondence from E.F. Young, Jr., AISI, to Steven E. Silverman, Esq., EPA, dated July 25, 1986; correspondence from Earl F. Young, Jr., AISI, to Dwight Hlustick, EPA, dated December 2, 1986.

[72] The Agency is currently evaluating the risk posed by emissions of metals, unburned organics (including dioxins), and acid gases (e.g., HCl) from municipal waste combustors (MWCs) and is reviewing applicable regulatory and nonregulatory approaches.

is scheduled to be promulgated in Spring 1988.

In the interim, until the amendments are promulgated and effective, permit officials will be encouraged to use the omnibus provision of section 3005(c) of HSWA to prescribe permit conditions as necessary to protect human health and the environment.

V. Boilers, Industrial Furnaces, and Incinerators are BDAT for HOCs

The Agency notes that it recently proposed to establish incineration in accordance with sections 264.343 and 265.343 as Best Demonstrated Available Technology (BDAT) for certain hazardous wastes containing Halogenated Organic Compounds (HOC) at concentrations exceeding 1000 ppm. See 51 FR 44726 (December 11, 1986). EPA believes that burning HOC wastes in boilers and industrial furnaces pursuant to permit or interim status standards (or burning in small quantity burning devices) would be equally effective and also should constitute BDAT for these wastes. Accordingly, should the Agency adopt the standards proposed today (or comparable standards), the Agency would amend proposed § 268.42(a)(2) (51 FR 44740) to indicate that HOCs must be burned in incinerators, boilers, or industrial furnaces.

VI. Classification of Pickle Liquor

Although not related directly to today's proposal, the Agency is proposing one additional action today. It involves the scope of the listing of Hazardous Waste K062. This listing applies to pickle liquor from steel finishing operations at facilities within the iron and steel industry (SIC Codes 331 and 332). When EPA first promulgated this amendment in May 1986, the Agency erroneously described the scope of the listing as applying to plants that actually produce iron and steel. 51 FR 19320 (May 28, 1986). This error was inadvertent and obviously unintended given that EPA had never proposed such a change, no commenter ever suggested such a change, and, in the relevant preambles, the Agency repeatedly described its action as applying to all plants in the iron and steel industry (50 FR 38966/1, 36967/1, 36967/2 (Sept. 20, 1985) and 51 FR 19320/2, 19321/1 (May 28, 1986)). In addition, if the listing was to apply only to facilities actually producing iron and steel, then the listing would be narrower than a parallel exclusion from listing of sludge generated from treatment of "spent pickle liquor from the iron and steel industry (SIC Codes 331 and 332)" (§ 261.2(c)(2)(ii))—a facial contradiction since one cannot exclude more than one has listed.

For these reasons, EPA corrected the error by means of a technical correction (51 FR 33612 (Sept. 22, 1986)). One person questioned this change arguing that it was in fact substantive rulemaking requiring prior notice and comment. Although we think this petition is without merit for the reasons given above, to avoid further dispute we will propose the change. Until this proposal is finalized, the scope of the listing is as stated in the correction notice, namely pickle liquor generated by plants in the iron and steel industry (SIC Codes 331 and 332).

VII. Landfill Gas

In the November 29, 1985, final rules, we indicated that gas recovered from hazardous waste landfills was not presently regulated under the waste as fuel rules. 50 FR 49171. EPA took this action in order to study further the extent to which these might be jurisdictional limits on the Agency's RCRA authority. *Id.* We are proposing to amend this language slightly by indicating that it applies as well to gas recovered from solid waste landfills. See proposed § 266.30(a). This allows for the possibility of the gas itself exhibiting a characteristic of hazardous waste. We are continuing to consider the jurisdictional issued, including the implications of section 124(b) of the recent Superfund Amendments and Reauthorization Act of 1986 (SARA) (which addresses the regulatory status of methane recovered from any type of landfill).

The Agency also solicits comment on whether the hydrocarbon phase of the condensate removed from recovered gas should also be exempt when burned as fuel. There do not appear to be jurisdictional issues for this material; the hydrocarbon phase appears to be classified as solid and hazardous waste by the SARA provision cited above, as well as by existing EPA rules (as a hazardous secondary material burned for energy recovery). EPA is not precluded, however, from promulgating an exemption if regulation is unnecessary to protect human health and the environment, and would consider doing so if shown that the hydrocarbon phase is chemically similar to normal fossil fuels, or if burning and storage of the hydrocarbon phase otherwise poses insufficient hazard to warrant regulation. Commenters should address these points explicitly, and provide supporting data.

Part Six: Administrative, Economic, and Environmental Impacts, and List of Subjects

I. State Authority

A. Applicability of the 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 the 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 retain final authorization, the HSWA applies in authorized States in the interim.

Today's proposed rule will be promulgated pursuant to section 3004(q) of RCRA, a provision added by HSWA. Therefore, this rulemaking would be added to Table 1 in § 271.1(j) which identifies the Federal program requirements that are promulgated pursuant to HSWA and that take effect in all States, regardless of their authorization status. States may apply for either interim or final authorization for the HSWA provisions identified in Table 1 as discussed below.

B. Effect on State Authorization

As noted above, EPA would implement today's rule in authorized States until they modify their programs to adopt these rules and the modification is approved by EPA. Because the rule would be promulgated pursuant to HSWA, a State submitting a program modification may apply to receive either interim or final authorization under section 3006(g)(2) or 3006(b), respectively, on the basis of requirements that are substantially equivalent or equivalent to EPA's. The procedures and schedule for State program modifications under section 3006(b) are described in 40 CFR 271.21. See 49 FR at 21678 (May 22, 1984). The same procedures should be followed for section 3006(g)(2).

40 CFR 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 deadlines for the State to modify its program for 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 exceptional cases (40 CRF 271.21(e)(3)). Once EPA approves the modification, the State requirements become Subtitle C 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 implement these requirements in lieu of EPA until the State program modification is approved. Of course, States with existing standards may continue to administer and enforce their standards as a matter of State law. In implementing the Federal program EPA will work with States under cooperative agreements to minimize duplication of efforts. In many cases EPA will be able to defer to the States in their efforts to implement their programs, rather than take separate actions under Federal authority.

States that submit official applications for final authorization less than 12 months after promulgation of EPA's regulations may be approved without including standards equivalent to those promulgated. However, once authorized, a State must modify its program to include standards substantially equivalent or equivalent to EPA's within the time periods discussed above.

II. Regulatory Impact Analysis

A. Purpose

The Agency is required under Executive Order 12291 to prepare a Regulatory Impact Analysis that provides estimates of compliance costs, economic impacts, and the risk reduction associated with the proposed regulation. The results of these analyses are used to determine whether the regulation is "major" as defined by E.O. 12291. The Agency is also required under the Regulatory Flexibility Act to assess small business impacts resulting from the proposed rule.

The results of the above analyses indicate that today's proposed regulation is neither a major rule, nor will it significantly impact small entities. This section of the preamble discusses the results of the cost, impact, and risk analyses of the proposed rule as detailed in the draft Regulatory Analysis for Waste-as-Fuel Technical Standards: Proposed Rule, October, 1986. The draft RIA is available in the public docket.

The regulatory impact analysis results (i.e., costs, impacts, risks) presented in this section do not fully reflect today's proposed rule. Specifically, the RIA does not fully assess the effects of the risk based standards for metals and chlorine. The RIA does not assess the effect of varying the standards with the type and number of devices at a given facility, and on the type of surrounding terrain (flat or complex). Other components of the rule that are not analyzed in the RIA include the Tier IV standard, current quantity limits for the small quantity burner exemption, variance for low risk wastes, eligibility of stoker coal devices for the trial burn waiver, the requirement of a redundant carbon monoxide monitoring system, and burning solely for the purpose of materials recovery. These new components of the rule, and how they may affect the analysis presented in the RIA, are discussed in the draft Effects of Recent Changes on the Estimated Costs and Benefits of the Proposed Waste as Fuel Technical Standards, January 1987. This report is an addendum to the RIA and is available in the public docket.

It is unclear how these components of the rule would affect the absolute results of the cost, economic impact, and risk analyses presented in the RIA. However, the Agency believes that the basic conclusions presented in this section should be applicable to today's rule. Moreover, the Agency believes that the rule would remain a non-major regulation as defined by the $100 million annual criteria of E.O. 12291.

B. Affected Population

The characteristics of the burners that would be potentially affected by today's proposed rule were obtained from the Waste-as-Fuel Survey of 1984.[73] The sample design and general survey results are described in the Final Report for the Survey of Waste-as-Fuel: Track II, November 1985, conducted for EPA by Westat, Inc. This report is available in the public docket.

The Waste-as-Fuel (WAF) Survey was designed to collect information on burners of waste derived fuel material (WDFM) and used or waste oil that are not regulated as incinerators under RCRA Subtitle C. The subset of those devices burning hazardous waste derived fuel material (HWDFM) for energy recovery was identified from the set of all WDFM burners.

The baseline for this analysis consists of burners who currently fire HWDFM for energy recovery. The WAF Survey characterized burning practices in 1983. Several rules have been imposed since then that would affect the decision to burn HWDFM. The results from the survey were adjusted, to the extent possible, to account for these rules: the Definition of Solid Waste promulgated January 4, 1985 (50 FR 614), the Phase I Administrative Standards promulgated November 29, 1985 (50 FR 49164), and the Standards for Hazardous Waste Storage and Treatment Tank Systems and Generators promulgated July 14, 1986 (51 FR 25422). The adjusted set of hazardous waste burners represents the population potentially affected by today's proposed rule.

EPA estimated the cost, impact, and risks on facilities that are estimated to be burning HWDFM when today's proposed rule becomes effective. EPA did not estimate the net effect of various incentives (or disincentives) that will exist in the future on burning HWDFM and are independent of today's proposed rule. Generally, cost increases for alternative waste management practices will act as an incentive for burning, while lowering of energy prices will serve as a disincentive to burn HWDFM. New restrictions on land disposal generator wastes serve as incentives for increased burning of HWDFM. The net effect will likely be increased incentives for burning hazardous waste. An increase in future burning of HWDFM would result in

[73] The survey sample design did not include SIC 14 for which the Agency is aware of light-weight aggregate kilns that are fired with hazardous waste derived fuel material (HWDFM). The Agency adjusted the survey results to account for these devices.

greater costs and changes in risk when compared to the estimates presented in this analysis. However, at present, the Agency is unable to determine the net effect of these factors on future burners of hazardous waste, the characteristics of future burners, and the subsequent responses to the proposed requirements. Thus, the analysis presented here concerns only current burners of HWDFM as reported in the WAF Survey and as adjusted to include lightweight aggregate kilns.

The affected population consists of approximately 895 boilers burning 115 million gallons of HWDFM per year and 57 industrial furnaces burning 114 million gallons of HWDFM per year. Industrial boilers represent 94 percent of all devices burning HWDFM and burn 50 percent of all HWDFM.

The majority of the HWDFM is burned by a few facilities. Approximately three percent of the facilities burn 44 percent of all HWDFM. Moreover, the WAF Survey indicates that although the burning of HWDFM is widespread across many industries, it is not prevalent within any one industry. Based on the WAF Survey and the 1982 Census of Manufacturers, only SIC 2611 (pulp mills) and SIC 2865 (cyclic crudes and intermediate organic chemicals) have reported burning of HWDFM in greater than 10 percent of the industry (11.2 and 11.1 percent respectively).

The chemicals industry (SIC 28) contains 17 percent of the facilities that burn 54 percent (or 123 million gallons annually) of the HWDFM. Thus, typically large quantities of HWDFM (986,511 gallons annually) are burned per facility in this industry. Most facilities in the chemicals industry burn wastes that are generated on-site.

Other industries that burn large quantities of HWDFM annually (greater than 10 million gallons) are: non-metallic minerals, except fuels (SIC 14); paper and allied products (SIC 26); chemicals and allied products (SIC 28); petroleum and related products (SIC 29); and stone, clay, glass, and concrete (SIC 32). Similar to the chemicals industry, relatively few facilities are reported in these industries indicating that, on average, large quantities of HWDFM are burned per facility.

Two industries, in addition to SIC 28, have more than 100 facilities burning HWDFM: furnitures and fixtures (SIC 25); and auto repair and service (SIC 75). These industries burn less than one percent of all HWDFM. On average, relatively small quantities of HWDFM (i.e., 6,000 gallons annually) are burned per facility within these industries.

C. Cost Analysis

1. *Methodology.* To obtain the incremental regulatory costs,[74] it is first necessary to determine the net savings achieved in the baseline from firing HWDFM. Burning HWDFM for energy recovery results in reduced requirements for primary (conventional) fuels. The savings are a function of the quantity and price of primary fuel displaced. Relative heat content must be considered when determining quantity of primary fuel displaced with HWDFM.

Savings also include the avoided alternative disposal costs for on-site burners. The alternative method of disposal was considered to be incineration at a cost of $0.34 per gallon of HWDFM burned. This figure includes a component for transporting the wastes off-site. The actual alternative disposal cost will depend on what options are available to the facility operator, and on the characteristics of the diverted wastes (i.e., suitability of wastes for burning). More precise estimates of disposal costs were not possible due to limited information on available options and waste characteristics for the specific burners.

The above net savings were not adjusted to account for increased operating and maintenance costs due to firing hazardous waste fuel. It is possible that burners would encounter increased costs due to corrosion, fouling, ash disposal, or pretreatment of the wastes. These costs would vary with the device and waste type. Detailed information was not available to estimate these costs. Net savings tend to be overstated by not including these costs.

The level of net savings for a given burner was used to predict the response to the proposed rule. The methodology assumes that burners will discontinue burning HWDFM if their potential compliance costs exceed net savings. Thus, the total net savings for all burners represents an upper bound on compliance costs reflecting the worst case scenario where all burners would discontinue firing HWDFM.

To derive compliance costs, the Agency developed unit costs of compliance for the proposed rule and engineering costs for model devices.[75]

[74] All cost figures are in 1985 dollars. A seven percent real rate and a five percent inflation rate were used to discount future cash flows.

[75] Engineering-Science. *Background Information Document for the Development of Regulations to Control Burning of Hazardous Waste in Boilers and Industrial Furnaces*, Volumes I and II, January 1987. NTIS Order Nos. PB 87 173829 and PB 87 173837.

Compliance activities include installation of carbon monoxide and oxygen monitors, trial burns, reduction in quantity of HWDFM fired to meet emissions limits, prohibiting firing of HWDFM at start-up and shut-down, trial burns, installation of air pollution control equipment, and administrative requirements.

Each of the devices that reported burning HWDFM in the WAF Survey was assigned to a model device. The least-cost option was determined for each device reported in the survey to comply with the regulation (or discontinue burning if compliance costs exceed net savings). The costs for the individual survey respondents were then extrapolated to estimate national costs.

The characteristics of each device as reported in the WAF Survey represent the current design and operating practices from which the Agency estimated incremental costs. The WAF Survey provided detailed information on the burners that included device type, device size, annual quantity of HWDFM burned, use of monitoring and air pollution control devices, source of waste (on-/off-site), method of firing wastes into the combustion device, and current regulatory status under RCRA.

Although the survey requested waste code and a description of the waste burned, it did not ask for waste constituent data. Since costs (and risks) can vary considerably with waste constituent levels, a sensitivity analysis was performed to account for various waste levels (e.g., POHCs, metals, chlorine).

Costs and risks also vary with assumptions on the levels of device destruction and removal efficiency (DRE) of organics and air pollution control device removal efficiencies (REs) achieved in the baseline. (All devices are assumed to meet the target level of 99.99 percent DRE after imposition of the proposed requirements.) The DRE and RE levels were varied in the baseline to test the sensitivity of these assumptions to costs and risks. Results of varying DRE and RE levels are not presented in this preamble although the results are detailed in the RIA. Waste characteristics tend to vary across burners more so than DRE or RE, and the waste sensitivity analysis that has been conducted has the greatest affect on costs and risks.

Costs were estimated for two types of wastes: a base case waste and a high risk waste. A waste database (for metals levels) was assembled from wastes that are currently being burned or could potentially be combusted.[76] The base case waste was assumed to contain metals levels at the 50th percentile and 'typical' POHC and chlorine levels.[77] The high risk waste was assumed to contain 90th percentile metals levels and 'high' POHC and chlorine levels.

The actual cost of the proposed rule is more likely to be near the cost for the base case waste scenario. The base case waste is assumed to be a more representative waste (containing 50th percentile metals levels and typical levels of POHCs and chlorine) than the high risk waste. However, an exact estimate of compliance costs cannot be made due to the lack of waste constituent data for specific burners.

Facility operators have several options for complying with the proposed rule. These options consist of conducting a trial burn to prove 99.99 percent destruction and removal efficiency (4-9's DRE); waiving the trial burn if special design and operating conditions are met (for boilers only); qualifying for the small quantity burner exemption if quantity limits are met for a given device size and wastes are burned on-site; and discontinue burning HWDFM if compliance costs exceed net savings. Estimates of costs presented in this section assume that the facility operator will choose the least-cost option in complying with the proposed rule.

2. *Results.* The Agency determines that the proposed rule will result in a social cost between 8.2 and 77.0 million dollars on an annualized basis.[78] Thus, based on the $100 million annual cost threshold established in E.O. 12291, today's proposed rule is non-major.

The $8.2 million figure is the social cost for the base case waste scenario; the $77.0 million figure represents the worst case scenario where all devices discontinue burning HWDFM. (Although the Agency does not believe that the worst case scenario is the likely outcome of the proposed rule, it does provide an upper bound on the cost of today's rule.) The social cost associated with the high risk waste scenario is $37.3 million annually.

Table 5 presents the estimated average compliance cost per device type and the anticipated response of device owner/operators to the proposed rule. Also listed is the percent of waste burned (or displaced) for each option. Sixty-five percent of the boilers are estimated to qualify for the small quantity burner exemption; however, less than one percent of all HWDFM is burned under this exemption. This reflects the WAF Survey finding that a large number of boilers fire very small quantities of waste. These boilers would most likely discontinue burning HWDFM if not allowed to continue under the small quantity burner exemption. Approximately 40 percent of the boilers that elect the small quantity burner exemption do so while firing the same quantity of HWDFM as in the baseline. The other 60 percent of the boilers reduce the amount of HWDFM fired (and incur lost savings) in order to meet the small quantity burner exemption quantity limits.

TABLE 5. AVERAGE COMPLIANCE COST PER DEVICE AND ESTIMATED RESPONSE TO REGULATION

[Base Case Waste]

	Average cost per device*	Small quantity burner exemption, (percent)	Trial burn waiver, (percent)	Trial burn, (percent)	Discontinue burning, (percent)
Boilers	$8,942	65	11	2	22
Kilns	$47,754	5	N/A	95	0
Other furnaces	$34,314	13	N/A	87	0
Percent of waste burned/displaced		<1	44	53	3

* Dollars are before-tax, annualized.
N/A—not applicable as device type is not eligible for trial burn waiver.

The weighted average annualized before-tax cost for boilers of $8,942 consists of: an average cost of $5,490 for boilers operating under the small quantity burner exemption (representing lost savings to meet the quantity limits); an average cost of $40,260 for boilers that elect the trial burn waiver; an average cost of $42,650 for boilers that conduct a trial burn; and an average cost of $161 for boilers that discontinue burning HWDFM. The majority of boilers that stop burning HWDFM are space heaters and are not eligible for the small quantity burner exemption because their design heat input is less than the minimum allowed for the small quantity burner exemption. These space heaters are operated in the services (non-manufacturing) industry and burn very small quantities of hazardous waste as reflected by the low average annualized compliance cost.

Kilns and other industrial furnaces can incur substantial compliance costs and continue burning HWDFM due to the large quantities of waste fired per device. The average annualized before-tax compliance cost for kilns (i.e., cement, lime, lightweight aggregate) is $47,754 and the average cost for other furnaces (e.g., blast furnaces) is $34,314.

Almost all of the waste (97 percent) is burned by devices that conduct a trial burn or satisfy the trial burn waiver conditions. Approximately three percent of the HWDFM burned in the baseline is displaced from devices that discontinue burning or devices that continue to burn but at a reduced quantity. As stated previously, less than one percent of the waste is burned under the small quantity burner exemption.

Table 6 presents similar information for the high risk waste (i.e., 90th percentile metals levels, "high" POHC and Cl levels). The device response to the proposed rule is similar to the base case waste although the average cost per device is significantly higher for all devices.

[76] Engineering-Science, *Background Information Document for the Development of Regulations to Control Burning of Hazardous Waste in Boilers and Industrial Furnaces*, Volume I, January 1987, NTIS Order No. PB 87 173829.

[77] POHC and Cl levels obtained from the RCRA Risk-Cost Analysis Model Waste Stream Data, SCS Engineers, July 1984.

[78] The social cost is the cost to society, independent of any transfer payments (e.g., taxes). The social cost of the proposed rule does not include lost fuel savings to the original burner for displaced wastes. Thus, the social cost for displaced wastes is only the alternative disposal cost assumed to be $0.34 per gallon. The lost conventional (e.g., fossil) fuel savings for a burner who reduces the quantity fired or stops burning HWDFM are assumed to be transferred to the burner who has excess capacity to accept the displaced wastes.

However, the lost fuel savings are included when estimating the before and after-tax private costs to individual facilities. The after-tax annualized cost to industry for the base case waste scenario is $5.2 million, $30.6 million for the high risk waste, and $63 million for the worst case scenario (where all devices discontinue burning HWDFM).

TABLE 6. AVERAGE COMPLIANCE COST PER DEVICE AND ESTIMATED RESPONSE TO REGULATION

[High Risk Waste]

	Average cost per device*	Small quantity burner exemption, (percent)	Trial burn waiver, (percent)	Trial burn, (percent)	Discontinue burning, (percent)
Boilers	$58,400	66	10	3	22
Kilns	$160,428	5	N/A	81	14
Other furnaces	$149,763	13	N/A	87	0
Percent of waste burned/displaced		<1	15	51	33

* Dollars are before-tax, annualized.
N/A—not applicable as device type is not eligible for trial burn waiver.

Table 7 shows the components of the aggregate compliance costs for the base case and high risk waste scenarios. The major component under each waste scenario is lost savings from burners who must reduce the quantity of HWDFM fired in order to meet the limits for organics, metals, and chlorine. Boilers will reduce tne HWDFM quantity fired under either waste scenario. Boilers are more likely to reduce the quantity of HWDFM burned rather than install expensive air pollution control equipment. The Agency estimates that no boilers will be installed with new air pollution control under the base case waste scenario and only 10 boilers will be equipped with air pollution control under the high risk waste scenario. These 10 boilers fire large quantities of HWDFM (greater than 1 million gallons annually) and at high feed rates (greater than 25 percent total heat input). Thus, for these boilers, the potential lost savings in displaced wastes required by blending to meet the limits would exceed the cost to install air pollution control. The difference between the two scenarios for the CO and O_2 monitors reflects the greater number of devices that discontinue burning HWDFM under the high risk waste scenario.

TABLE 7.—COMPONENTS OF COMPLIANCE COSTS

[Dollars in millions, annualized, after-tax]

	Scenario		
	Base case waste	High risk waste	Worst case (all stop firing)
Type of cost			
Lost savings	$2.3	$25	$63.0
O_2 Monitoring	0.4	0.3	
CO monitoring	1.5	1.3	
Air pollution control	0.0	2.9	
Trial burns	0.4	0.4	
Administrative requirements	0.6	0.6	
Testing	<0.1	0.1	
Total costs	5.2	30.6	63.0

Industrial furnaces are currently installed with some form of air pollution control equipment that will allow for compliance with the emissions limits, without reducing the quantity of HWDFM fired, under the base case waste scenario. However, in certain cases under the high risk waste scenario, the air pollution control equipment must be supplemented with a reduction in quantity in order to meet the limits.

Carbon monoxide (CO) monitoring is also a significant component of compliance costs. The WAF Survey indicates that only a few boilers (mostly those burning large quantities of HWDFM) are currently monitoring for CO. Although most kilns and other furnaces currently monitor for CO, the Agency believes that these monitors are not sensitive enough to show compliance with the limits established in today's proposed rule. A total of 104 boilers, 30 kilns, and 22 other furnaces (about 16 percent of all devices currently burning HWDFM) are estimated to install CO monitors under the base case waste scenario. A total of 95 boilers, 26 kilns, and 22 other furnaces (15 percent of all devices burning HWDFM) are estimated to install CO monitors under the high risk waste scenario. The annualized before-tax cost for CO monitoring is approximately $20,000 per year.

D. Economic Impacts

1. *Methodology*. The economic analysis focused on facility level impacts. Industry level impacts were not considered since the results of the WAF Survey suggest that burning HWDFM is practiced by only a small percentage of facilities in any one industry. (Although the burning of HWDFM is practiced across a wide range of industries.) Industry-wide impacts would not be significant where only a small percentage of facilities incur regulatory costs.

The percentage of facilities firing HWDFM also influences whether compliance costs, resulting from the proposed rule, are absorbed by the facility or are passed through as price increases. Since few facilities within any industry burn HWDFM, they are more likely to absorb regulatory costs and thus face reduced profitability or possibly plant closure.

If the facilities were to pass through the compliance costs in the form of higher prices, the facilities might then be at a competitive disadvantage with other facilities that did not incur increased costs. Therefore, potential economic impacts of this rule are more likely to take the form of reduced profitability and possibly plant closure.

Little information was available regarding the profitability of affected burners in the baseline. Facilities burning HWDFM might be experiencing returns that are below or above the industry average. The lack of uncertainty on the financial strength of the affected burners prohibits predicting impacts with certainty. Thus, the economic analysis presented will identify industries where facilities are most likely to experience impacts, based on average financial measures of strength for that industry and employee size range.

A two stage analysis was conducted in determining impacts. First, a screening analysis was performed to identify those facilities that may be significantly impacted. The total compliance cost for all devices burning HWDFM at a facility was compared to the total baseline operating and maintenance (O&M) cost for those devices. Operating and maintenance costs include net fuel savings from burning HWDFM. As stated previously, net savings have not been adjusted due to increased costs for pretreatment, corrosion maintenance, or ash disposal. Overstating net savings will understate total O&M costs; thus, the percent increase in O&M costs due to the compliance costs may be overstated.

Facilities were considered to face potentially significant impacts if the total cost of compliance exceeded the total O&M cost for all devices by five percent or greater. Generally, an increase in facility costs will be less than the increase in device O&M costs. Similarly, it is unlikely that significant impacts would be imposed on a facility if one segment of its operations incurred an increase of less than five percent. Thus, a five percent increase in device O&M costs represents a conservative screen for potential facility impacts.

The screening analysis was conducted on boilers only. No baseline device O&M costs were available for kilns and other furnaces. However, all kilns and other furnaces burning HWDFM were included in the second stage of the analysis.

The second stage consisted of an analysis to assess impacts on the facility level. All devices were analyzed for facility level impacts. The facility's cost of compliance was compared to three measures of plant financial strength: cash from operations (CFO), cost of production (COP), and value of shipments (VOS). Plant-specific financial information was not available for the affected burner population. The three measures of plant financial strength that were used in the analysis are representative facility values for a given four digit SIC code and employee size range. A facility is considered to face a significant impact if the cost of compliance for all devices at the facility exceeds 5 percent of any of the three financial measures.

The ratio of compliance costs to COP reflects the price increase required to recover the compliance costs and maintain the facility's profit margin; comparing costs to VOS represents the required price increase to recover costs, without any mark-up for profit margin; the ratio of compliance costs to CFO represents the decrease in profitability if the facility absorbs the regulatory costs. As stated previously, it is probable that costs will be absorbed where few facilities within an industry incur compliance costs from today's proposed rule and, thus, compliance costs as a percentage of CFO is the most relevant parameter.

Moreover, the cost of compliance relative to CFO is often the most conservative indicator of potential impacts. Cash from operations is the difference between the value of shipments (VOS) and the cost of production (COP). CFO is always less than VOS and often smaller than COP. Thus, costs as a percentage of CFO is usually greater than costs as a percentage of VOS or COP and will typically represent the most conservative indicator.

2. *Screening analysis results.* For the base case waste scenario, 14 facilities (representing 15 boilers), from a total of 708 facilities with boilers burning HWDFM, incur compliance costs that exceed 5 percent of total baseline O&M costs. Table 8 presents these figures. These facilities mostly operate in the chemicals industry (SIC 28) and tend to fire HWDFM at greater percentages of the heat input than other facilities whose compliance costs are less than 5 percent of baseline O&M costs.

TABLE 8.—OVERVIEW OF SCREENING ANALYSIS RESULTS FOR BOILERS BASE CASE WASTE

Increase in O&M costs (percent)	Number of facilities	Number of boilers	Percent of all boilers (percent)	Annual average HWDFM per device (percent total Btu)
<5	694	880	98.3	1.52
5–9	9	10	1.2	9.26
10–24	0	0	0.0	NA
25–74	5	5	0.5	38.17
75–99	0	0	0.0	NA
100+	0	0	0.0	NA
All boilers	708	895	100.0	1.79

The Agency estimates that all of these boilers will continue burning HWDFM after implementation of the proposed rule. The Agency also believes that this scenario is the most likely outcome of the proposed rule.

Table 9 provides screening analysis results for the high risk waste scenario. Sixty-two facilities (representing 102 boilers) incur compliance costs that exceed 5 percent of baseline O&M costs. The boilers at these facilities also tend to be fired with HWDFM at higher rates than boilers at other facilities. All of these boilers are estimated to continue burning HWDFM as a result of the proposed rule.

TABLE 9.—OVERVIEW OF SCREENING ANALYSIS RESULTS FOR BOILERS HIGH RISK WASTE SCENARIO

Increase in O&M costs (percent)	Number of facilities	Number of boilers	Percent of all boilers (percent)	Annual average HWDFM per device (percent total Btu)
<5	646	793	88.6	0.69
5–9	19	39	4.3	5.03
10–24	26	30	3.4	9.72
25–74	17	33	3.7	17.15
75–99	0	0	0.0	NA
100+	0	0	0.0	NA
All boilers	708	895	100.0	1.79

Under the worst case scenario, where all devices discontinue burning HWDFM, 71 facilities (representing 116 boilers) are estimated to incur compliance costs exceeding 5 percent of baseline O&M costs. The Agency does not believe this scenario is the likely outcome of the proposed rule, especially for those boilers firing large quantities of HWDFM that are likely to incur compliance costs that are well below net savings. However, these results do provide an upper-bound estimate of cost increases and impacts from the proposed rule.

3. *Facility level analysis results.* Under the base case scenario, one WAF Survey respondent (representing 14 facilities with one boiler each operating in SIC 7399) is estimated to incur compliance costs exceeding 5 percent of CFO. This respondent does not incur compliance costs greater than 5 percent of baseline O&M costs in the screening analysis. The Agency believes that the industry average financial measures may understate the true financial health of this facility, and that the result from the screening analysis is a better indicator of potential impacts for this facility. These 14 facilities are reported as operating in the services industry as solvent recyclers and are estimated to continue burning HWDFM under the trial burn waiver (for both the base case and high risk waste scenarios). The Agency, therefore, believes it is unlikely that there will be significant impacts on any facilities under the base case waste scenario.

Table 10 presents estimates of facilities experiencing significant impacts for any of the three financial measures under the high risk waste scenario. Of the twenty-three facilities estimated to face potentially significant impacts, only two facilities (with two kilns each), operating in SIC 3241, are estimated to discontinue firing HWDFM. The 23 facilities operate in SICs: 1422—Crushed and Broken Limestone; 2800—Chemicals Manufacturing; 2861—Gum and Wood Chemicals; 3241—Cement, Hydraulic; and 7399—Business Services, Not Elsewhere Classified.

TABLE 10.—OVERVIEW OF IMPACTS BY INDUSTRY [1] UNDER THE HIGH RISK WASTE SCENARIO PROPOSED RULE

SIC	Number of facilities	Number of devices	Average number of employees per facility	Average device size (MMBtu/hour)	Average HWDFM burned per device (gallon/hour)	Average cost of compliance/cost of production per facility (percent)	Average cost of compliance/value of shipments per facility (percent)	Average cost of compliance/cash from operation per facility (percent)
Crushed and Broken Limestone								
1422	1	2	60	50.0	4,000,000	29.12	61.88	19.80
Chemicals and Allied Products								
2800	2	10	1450	497.7	4,513,880	3.16	2.01	5.51
Gum and Wood Chemicals								
2861	5	11	221	73.8	623,698	2.34	1.99	13.48
Cement, Hydraulic								
3241	2	5	165	180.0	2,372,486	4.15	2.79	8.50
Business Service, NEC								
7399	14	14	45	20.0	190,000	16.39	13.12	65.58
Totals [2]	23	41.0						

[1] Includes only facilities with cost of compliance greater than 5 percent of O&M Cost (when available) and greater than 5 percent of Cash from Operations, Cost of Production, or Value of Shipments, except for SIC 7399 where compliance costs are less than 5 percent of device O&M cost.

[2] Totals may not equal sum of rows due to rounding.

Under the worst case scenario, 33 facilities are estimated to incur significant impacts as a result of the proposed rule. In addition to the five industries impacted under the high risk waste scenario, facilities in SIC 2631—Paperboard Mills, SIC 2819—Industrial Inorganic Chemicals, Not Elsewhere Classified; SIC 2869—Industrial Organic Chemicals, Not Elsewhere Classified; and SIC 3312—Blast Furnaces, Steelworks, and Rolling Mills are also estimated to incur significant impacts. As stated previously, the Agency does not believe this scenario to be the likely outcome of the proposed rule.

E. Risk Analysis

1. *Methodology.* For each of the boilers and industrial furnaces, EPA estimated the quantity and composition of stack releases; atmospheric transport, resulting ground level concentration and exposure to the stack release constituents; and, the doses received by the most exposed individual (MEI) and by human populations within 50 kilometers of each device. Estimates were made for each device burning HWDFM in the baseline and after imposition of the proposed rule. This allowed for a determination of the incremental risk reduction achieved by the proposed requirements.

The Agency estimated carcinogenic health effects (i.e., cancer cases) from emissions of principal organic hazardous constituents (POHCs), products of incomplete combustion (PICs), and metals (i.e., arsenic, cadmium and chromium). The Agency also determined exposure levels (but not cases) from emissions of the threshold compounds lead, hydrogen chloride, and toluene. EPA considered air emissions and exposure due to inhalation but did not address other types of releases (e.g., spills from storage or transportation, fugitive emissions) and routes of exposure (e.g., ingestion of contaminated crops or animals).

Changes in health risk may result from the upgraded performance of a device due to achieving compliance with the proposed rule. Improved performance may result from the installation (or upgrading) of APCDs, the installation of CO and O_2 monitors to ensure optimum combustion efficiency, and prohibiting firing of HWDFM at start-up and shut-down.

Alternative management of displaced wastes will also affect changes in risk. Displaced HWDFM from devices that stop burning or that reduce the quantity fired was assumed to be burned in industrial furnaces that accept off-site wastes and continue to burn HWDFM (but not reduce the quantity fired) after imposition of the proposed rule. Results from the WAF Survey indicate that industrial furnaces, especially kilns, tend to burn large quantities of HWDFM that are generated off-site. Boilers tend to fire smaller quantities of HWDFM that are often generated on-site. Thus, industrial furnaces are more likely than boilers to accept off-site wastes. Inherent in this scenario is the assumption that the displaced wastes contain sufficient heat content so that they are attractive for burning for energy recovery.

The waste scenarios used in the risk analysis are identical to those used in the cost analysis. The composition and firing rate of the HWDFM determines the amount of hazardous constituents potentially released from the stack. The HWDFM firing rate for devices in the baseline is that reported in the WAF Survey. The firing rate for post-regulation is the level associated with the least-cost compliance method per device.

The level of destruction and removal efficiency (DRE) for organics and APCD removal efficiency (RE) for metals determines the actual stack releases of the constituents.

Devices operating in the baseline were assumed to be equipped with air pollution control devices (APCDs) as reported in the WAF Survey. Each APCD was assumed to achieve a level of removal efficiency that was considered typical for that APCD type.

Various DRE levels were assigned to the devices based on the reported presence of CO and O_2 monitors, charging of solid or liquid wastes into the device, and whether HWDFM represented more or less than 50 percent of the total fuel input. Although the stack tests conducted by EPA reveal that boilers can readily achieve 99.99 percent DRE, the range of design and operating conditions in the stack tests did not cover the wide range of conditions reported in the WAF Survey. Thus, respondent devices from the WAF Survey were assigned to DRE categories. All devices burning HWDFM after imposition of the proposed rule were assumed to achieve the target level of 99.99 percent DRE.

The location of each device as reported in the WAF Survey was used as an input for dispersion modeling that estimated the resulting exposure to human populations. Incorporating the location of each of the WAF Survey respondents allows for dispersion modeling that accounts for the climatology and general population surrounding the specific device.

Once the exposure estimates were determined, the dosage and resulting increased risk received by the human population (and most exposed individual) were calculated. Humans were assumed to breathe 22 cubic meters of air per day, absorb 100 percent of the hazardous material inhaled, weigh 70 kilograms, and be of "average" susceptability. No antagonistic or synergistic affects among the various compounds were analyzed. Stack releases were assumed to continue for 70 years, and all other factors also remained constant over this period (e.g., human population, weather). Finally, each incidence of risk for a device reported in the WAF Survey was extrapolated to obtain national estimates for the total population of devices burning HWDFM.

Health effects were also assessed from emissions of the non-carcinogenic (threshold) compounds lead, hydrogen chloride (HCl), and toluene. Toluene was chosen to represent a non-carcinogenic POHC since it is a compound often present in organic hazardous wastes.

The Agency calculated the ratio of predicted exposure (for both the MEI and average population) to the reference dose for each of the three threshold compounds. The sum of the three ratios was also calculated. Although the risks from threshold compounds may not be additive, the sum of the ratios does serve as an indicator of potential effects from exposure to multiple contaminants.

No information was available on the ambient (background) levels of the three compounds surrounding each specific device. This lack of data prohibits an analysis of how the exposure from burning HWDFM contributes to total ambient levels. If the resulting exposure from all sources of threshold compounds is less than the reference dose, then the burning of HWDFM produces no incremental health risk for these compounds. However, if the exposure from baseline burning of HWDFM and other sources exceed the reference dose, then the reduced exposure resulting from today's rule may reduce the health risk from any or all of these three compounds.

In order to consider the potential for significant ambient levels, EPA assumed that other sources could account for up to 90 percent of the reference does. This would allow for the burning of HWDFM to pose no health risk from each of the threshold compounds if the resulting exposure was less than 10 percent of the reference dose. Thus, a screening analysis was done to identify the number of devices burning HWDFM that produced emisisons of threshold compounds, in the baseline and after imposition of the proposed rule, that exceeded 10 percent or more of the reference dose.

2. *Results.* Table 11 presents estimates of the lifetime (i.e., 70 year) cancer cases for the base case waste scenario. Estimates are provided for devices operating in the baseline and those that continue to burn HWDFM (or burn displaced wastes) after imposition of the proposed rule.

TABLE 11.—EXPECTED LIFETIME CANCER CASES

[Base case waste scenario]

	POHC's	PIC's	Metals	Total
Baseline	1	1	16	18
Post-regulation	0	0	15	15
Cases avoided	1	1	1	3
Cases avoided from devices that continue to burn				3
Cases avoided from devices that discontinue burning				0
Cases from burning of displaced wastes				(<1)
Net cases avoided				3

The base case waste scenario results in 3 cases avoided from the 759 devices that continue to burn HWDFM after imposition of the proposed rule. There are no cases avoided from the 193 devices that discontinue burning HWDFM because over 95 percent of these devices are space heaters that are fired with very low quantities (100 gallons annually) of HWDFM. The burning of displaced HWDFM in industrial furnaces results in less than one lifetime cancer case. Thus, the net reduction in 70-year cases is approximately three. Under this waste scenario, all of the after-regulation risk and the majority of the baseline risk is from metals (i.e., arsenic, cadmium, chromium) emissions. It is likely that many wastes will not have all three metals at the assumed levels. The above results may overstate risks for these types of wastes.

Table 12 presents the risks to the most exposed individual (MEI); the Agency estimates that there are no devices burning HWDFM in the baseline that pose a lifetime risk equal to or greater than one in ten thousand. Ten devices produce a risk to the MEI in the one in one hundred thousand range. The remaining 942 devices are estimated to produce a MEI risk in the one in one million range or less. After compliance with the proposed rule, no devices that were burning HWDFM in the baseline would generate incremental lifetime risks in the one in ten thousand range. Forty-eight devices are estimated to produce a MEI risk in the one in one million range, while the remaining 706 devices burning HWDFM generate risks in the one in ten million range or less.

TABLE 12.—RISKS TO THE MEI

[Base case waste scenario]

	Risk level	Number of devices	Percent of device population
Baseline	$>10^{-4}$	0	0
Do	10^{-4}	0	0
Do	10^{-5}	10	1
Do	10^{-6}	61	6
Do	10^{-7}	103	11
Do	$<10^{-7}$	778	82
Total		952	100
Post-regulation	$>10^{-4}$	0	0
Do	10^{-4}	0	0
Do	10^{-5}	6	1
Do	10^{-6}	48	5
Do	10^{-7}	56	6
Do	$<10^{-7}$	650	68
Total		759	80
Devices that discontinue burning		193	20

For noncarcinogenic effects under the base case waste scenario, EPA estimates that there are no devices producing MEI or average population exposures, in the baseline or after-regulation, exceeding 10 percent of any of the reference doses. The sum of the ratios is also less than 10 percent. Thus, if other sources produce exposure levels less than 90 percent of the reference doses, then the proposed rule achieves no benefits from reduced emissions of threshold compounds.

The Agency estimates that, under the high risk waste scenario, there are 391 cases avoided from the 755 devices that continue to burn and no cases avoided from the 197 devices that discontinue burning HWDFM. Table 13 presents these results. Alternative management of the displaced HWDFM produces 74 cases. Thus, there is a net reduction of 317 lifetime cases. Similar to the base case waste results, metals emissions account for the majority of the baseline and post-regulation risks.

TABLE 13.—EXPECTED LIFETIME CANCER CASES

[High risk waste scenario]

	POHC's	PIC's	Metals	Total
Baseline	25	4	582	611
Post-regulation	2	0	218	220
Cases avoided	23	4	364	391
Cases avoided from devices that continue to burn				391
Cases avoided from devices that discontinue burning				0
Cases from burning of displaced wastes				(74)
Net cases avoided				317

Table 14 presents estimates of MEI risk for the high risk waste scenario. In the baseline, 19 devices produce an MEI risk in the one in ten thousand range, 100 devices produce an MEI risk in the one in one hundred thousand range, and the remaining 833 devices produce an MEI risk in the one in one million range or less. After imposition of the proposed rule, no devices produce an MEI risk in the one in ten thousand range, 73 devices produce an MEI risk in the one in one hundred thousand range, and 682 devices produce an MEI risk in the one in one million range or less (197 devices discontinue burning HWDFM).

TABLE 14.—RISKS TO THE MEI

[High risk waste scenario]

	Risk level	Number of devices	Percent of device population
Baseline	$>10^{-4}$	0	0
Do	10^{-4}	19	2
Do	10^{-5}	100	11
Do	10^{-6}	167	17
Do	10^{-7}	198	21
Do	$<10^{-7}$	468	49
Total		952	100
Post-regulation	$>10^{-4}$	0	0
Do	10^{-4}	0	0
Do	10^{-5}	73	8
Do	10^{-6}	52	5
Do	10^{-7}	35	4
Do	$<10^{-7}$	595	62
Total		755	79
Devices that discontinue burning		197	21

For the high risk waste scenario, Table 15 shows that 45 devices would produce exposures exceeding 10 percent of the HCl threshold level in the baseline. A total of 58,838 people would be exposed to this HCl level. The sum of the ratios for the three compounds exceeds 10 percent at 47 devices (5 percent of all devices burning HWDFM) in the baseline. For these devices, the proposed rule eliminates all exposures greater than 10 percent of the threshold.

TABLE 15.—CHANGES IN NON-CANCER HEALTH RISK

[High risk waste scenario, average ratio of exposure to RFD >0.1]

Constituent	Baseline		Post-regulation	
	Number of devices	Total population w/in 50 km	Number of devices	Total population w/in 50 km
Noncarcinogenic POHC's	0	0	0	0
HCL	0	0	0	0
Lead	0	0	0	0
Sum of ratios	0	0	0	0

MEI RATIO OF EXPOSURE TO RFD >0.1

Constituent	Baseline		Post-regulation	
	Number of devices	Total population w/in 50 km	Number of devices	Total population w/in 50 km
Noncarcinogenic POHC's	0	0	0	0
HCL	45	58,838	0	0
Lead	0	0	0	0
Sum of ratios	47	64,915	0	0

F. Regulatory Flexibility Analysis

The Regulatory Flexibility Act (RFA) requires Federal regulatory agencies to evaluate the impacts of regulations on small entities. The RFA requires an initial screening analysis to determine whether the proposed rule will have a significant impact on a substantial number of small businesses.

This section discusses the methodology and results of the Agency's RFA screening analysis. Based on this analysis, the Agency has determined that today's rule will not have a substantial impact on a substantial number of small firms.

1. *Methodology.* The facility financial measures used in the overall economic analysis were used for the RFA screening analysis. A small entity was considered to be significantly impacted when the cost of compliance for one or more devices exceeded by five percent any of the three financial measures (i.e., cost of production, value of shipments, cash from operations).

The RFA defines small entities as small businesses, small organizations, and small governmental jurisdictions. The Small Business Administration's (SBA) definition of "small" ranges from 100 to 500 employees depending on the Standard Industrial Classification (SIC) code.

The cost and impact analyses were conducted at the facility rather than at the firm level due to lack of information on firm size. Neither the RFA nor the SBA defines "small" establishments, although for single-establishment firms the SBA's small business standards would apply. All facilities are considered to be single establishment firms for the impact assessment.

For purposes of this analysis, small entities were defined to be those facilities with fewer than 100 employees. Four size categories (i.e., less than 10, 10 to 50, 51 to 100, greater than 100 employees) were used to compare impacts between small and large establishments and the relative burden imposed on small businesses.

The Agency has defined "substantial number" as twenty percent of the affected small entities.[79] The population of affected small facilities as reported in the WAF Survey (and as adjusted to include lightweight aggregate kilns) was used for the analysis. If twenty percent of all facilities with less than 100 employees are significantly affected, then the proposed rule is considered to have a significant impact on a substantial number of small entities.

2. *Results.* The assessment of small business impacts was conducted for all devices burning HWDFM in the baseline.

As stated in Section D—Economic Impacts, the Agency estimates that no facilities will incur compliance costs that exceed 5 percent of any of the three financial measures for the base case waste scenario. Although, as identified above, 14 facilities operating in SIC 7399 are estimated to incur costs greater than 5 percent of CFO, EPA believes that the industry financial data on which this finding is based are not reliable for these facilities. Thus, EPA believes that these facilities will not experience significant impacts. Moreover, although these 14 facilities represent 49 percent of all facilities in the 10 to 49 employee size range, they represent only 5 percent of all small facilities (facilities with less than 100 employees). Thus, the Agency estimates that a substantial number of small entities will not be significantly impacted under the base case waste scenario. The Agency believes this scenario to be the most likely outcome of the proposed rule.

Table 16 shows an overview of impacts for the high risk waste scenario. Excluding the 14 facilities in SIC 7399, whose industry financial information is believed to be inappropriate, one "small" facility (in the 50 to 99 employee size range) is estimated to incur significant impacts. This facility operates in SIC 1422 and burns HWDFM in two kilns. Eight facilities (operating in SICs 2800, 2861 and 3241) with greater than 100 employees are also estimated to face significant impacts. The one "small" facility represents less than one percent of all facilities with less than 100 employees. (Including the 14 facilities in SIC 7399 would bring the total of significantly impacted small facilities to 6 percent of all facilities with less than 100 employees.) Thus, under the high risk waste scenario, it appears that a significant number of small entities will not be significantly impacted by today's rule.

[79] EPA, Guidelines for Implementing the Regulatory Flexibility Act, pp. 6–7.

TABLE 16.—OVERVIEW OF IMPACTS FOR SMALL ESTABLISHMENTS

[High risk waste scenario]

Establishment size (number of employees)	Total number of facilities	Total number of devices	Average cost of compliance/cost of production per facility (percent)	Average cost of compliance/value of shipments per facility (percent)	Average cost of compliance/cash from operations per facility (percent)	Facilities experiencing significant impacts	
						(Number)	(Percent of total)
<10	193	193	0.24	0.29	1.13	0	0.00
10 to 49	28	33	8.21	6.53	32.38	14	48.87
50 to 99	38	42	0.91	1.73	0.98	1	2.62
100+	480	685	0.12	0.09	0.35	8	1.76
Totals	738	952	0.50	0.47	0.60	23	

In summary, the Agency believes that it is unlikely that small entities will experience significant impacts under the base case scenario. Although one facility does experience significant impacts under the high risk waste scenario, it does not represent a "substantial number" of the affected small entities. Therefore, the proposed rule does not meet the Regulatory Flexibility Act criteria requiring that a full Regulatory Flexibility Analysis be completed.

The Agency solicits public comments and additional data regarding the assumptions, costs, risks, and possible impacts identified in the regulatory analysis.

G. 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.* An Information Collection Request document has been prepared by EPA (ICR No. 1361) and a copy may be obtained from Rick Westlund, Information Policy Branch; EPA; 401 M Street, SW., (PM-223); Washington, DC 20460 or by calling (202) 382-2745. Submit comments on these requirements to EPA and: Office of Information and Regulatory Affairs; OMB; 726 Jackson Place, NW.; Washington, DC 20503 marked "Attention: Desk Officer for EPA." The final rule will respond to any OMB or public comments on the information collection requirements.

III. *List of Subjects in 40 CFR Parts 260, 261, 264, 265, 266, 270, and 271*

Administrative practices and procedures, Confidential business information, Hazardous materials transportation, Hazardous waste, Indian lands, Insurance, Intergovernmental relations, Packaging and containers, Penalties, Recycling, Reporting and recordkeeping requirements, Security measures, Security bonds, Water pollution control, Water supply.

Dated: April 17, 1987.

Lee M. Thomas,

Administrator.

APPENDIX A.—REFERENCE AIR CONCENTRATIONS (RAC'S) FOR THRESHOLD CONSTITUENTS

Constituent	Maximum annual average ground level concentration (μg/m³)
Acetonitrile	10
Acetophenone	500
Acrolein	0.25
Aluminum phosphide	0.25
Allyl alcohol	5
Antimony	0.25
Barium	50
Barium cyanide	50
Benzidine	0.5×10^{-5}
Bis(2-ethylhexyl)phthalate	17
Bromomethane	0.7
Calcium cyanide	25
Carbon disulfide	200
Chlordane	5×10^{-3}
2-chloro-1,3-butadiene	2.5
Chloromethane	0.7
Chromium III	1,000
Copper cyanide	50
Cresols	100
Cyanide(free)	17
Cyanogen	25
Di-n-butyl phthalate	10
O-dichlorobenzene	10
Dichlorodifluoromethane	170
2,4-dichlorophenol	2.5
1,3-dichloropropene	0.25
Diethyl phthalate	10
Dimethoate	1.0
2,4-dinitrophenol	1.0
Diphenylamine	225
Endosulfan	0.01
Endrin	0.05
Flourine	50

APPENDIX A.—REFERENCE AIR CONCENTRATIONS (RAC'S) FOR THRESHOLD CONSTITUENTS—Continued

Constituent	Maximum annual average ground level concentration (μg/m³)
Formaldehyde	2×10^{-3}
Formic acid	1700
Heptachlor	0.1
Hexachlorocyclopentadiene	5
Hydrocyanic acid	17
Hydrogen chloride	(1)
Hydrogen sulfide	2.5
Isobutyl alcohol	250
Lead	0.09
Mercury	1.7
Metholmyl	23
Methoxychlor	50
Methly ethyl ketone	75
Methyl hydrazine	7×10^{-3}
Methyl parathion	2.5
Nickel	10
Nickel cyanide	17
Nitric oxide	25
Nitrobenzene	0.5
Pentachlorobenzene	1.7
Pentachlorophenol	25
Phenol	100
M-phenylenediamine	5
Phenylmercuric acetate	0.08
Phosphine	0.025
PCBs	2×10^{-4}
Potassium cyanide	50
Potassium silver cyanide	170
Pyridine	5
Selenious acid	2.5
Selenourea	5
Silver	5
Silver cyanide	100
Sodium cyanide	25
Strychnine	0.25
1,2,4,5-tetrachlorobenzene	0.25
2,3,7,8-tetrachlorodibenzo-p-dioxin	5×10^{-9}
2,3,7,8-tetrachlorophenol	10
Tetraethyl lead	1×10^{-4}
Thallic oxide	0.25

APPENDIX A.—REFERENCE AIR CONCENTRATIONS (RAC'S) FOR THRESHOLD CONSTITUENTS—Continued

Constituent	Maximum annual average ground level concentration (μg/m³)
Thallium	500
Thallium (I) acetate	0.5
Thallium (I) carbonate	0.25
Thallium (I) chloride	0.5
Thallium (I) nitrate	0.5
Thallium selenite	0.5
Thallium (I) sulfate	0.5
Toluene	500
1,2,4-trichlorobenzene	17
Trichloromonofluoromethane	250
2,4,5-trichlorophenol	100
Vandium pentoxide	17
Vinyl chloride	0.05

[1] Maximum of 150 for three minute average.

APPENDIX B.—RISK SPECIFIC DOSES FOR CARCINOGENIC CONSTITUENTS AT 10^{-5} Risk Level

Constituent	Risk specific dose (μg/m³)
Acrylamide	9×10^{-3}
Acrylonitrile	1×10^{-1}
Aldrin	2×10^{-3}
Aniline	1
Arsenic	2×10^{-3}
Benz(a)anthracene	1×10^{-2}
Benzene	1
Benzo(a)pyrene	3×10^{-3}
Beryllium	4×10^{-3}
Bis(2-chloroethyl)ether	3×10^{-2}
Bis(2-chloromethyl)ether	4×10^{-3}
Cadmium	6×10^{-3}
Carbon tetrachloride	7×10^{-1}
1-Chloro-2,3-epoxypropane	8
Chloroform	4×10^{-7}
Chloromethyl methyl ether	4×10^{-3}
Chromium (hexavalent)	8×10^{-4}
DDT	3×10^{-2}
Dibenz(a,h)anthracene	7×10^{-4}
1,2-Dibromo-e-chloropropane	2×10^{-3}
1,2-Dibromoethane	8×10^{-4}
1,4-Dichlorobenzene	2
1,2-Dichloroethane	4×10^{-1}
1,1-Dichloroethylene	2×10^{-1}
Dieldrin	2×10^{-3}
Diethylstilbestrol	7×10^{-5}
Dimethylnitrosamine	1×10^{-4}
2,4-Dinitrotoluene	1×10^{-1}
Dioxane	7
Ethylene oxide	1×10^{-1}
Hexachlorobenzene	2
Hexachlorobutadiene	5×10^{-1}
Hydrazine	3×10^{-3}
Hydrazine Sulfate	3×10^{-3}
3-Methylchlolanthrene	4×10^{-3}

APPENDIX B.—RISK SPECIFIC DOSES FOR CARCINOGENIC CONSTITUENTS AT 10^{-5} Risk Level—Continued

Constituent	Risk specific dose (μg/m³)
Methylene chloride	2
4,4-Methylene-bis-2-chloroaniline	2×10^{-1}
Nickel (carbonyl and Subsulfide)	3×10^{-2}
2-Nitropropane	4×10^{-3}
N-Nitroso-n-methylurea	1×10^{-5}
N-Nitrosopyrrolidine	2×10^{-2}
Pentachloronitrobenzene	1×10^{-1}
Pronamide	2
Reserpine	3×10^{-3}
1,1,2,2-Tetrachloroethane	2×10^{-5}
Tetrachloroethylene	21
Thiourea	2×10^{-2}
Trichloroethylene	8

Appendix C.—Example Tier I and Tier II Calculations

Example #1 (Tier I)

A 10 MM Btu/hr (heat input) boiler is burning hazardous waste at a rate of 150 lbs/hr along with 400 lbs/hr of heating oil. The boiler is located in flat terrain. The waste has a heating value of 10,000 Btu/lb and contains the metal concentrations:

Arsenic=0.5 ppm
Cadmium=1.0 ppm
Chromium=0.4 ppm
Lead=1.0 ppm

Question: Is the waste in compliance with Tier I standards?

For this case the following equation from proposed § 266.34-4(b)(3)(i)(B) applies:

$$(1)\ \frac{(As)}{3.9\times10^{-4}}+\frac{(Cd)}{9.8\times10^{-4}}+\frac{(Cr+6)}{1.4\times10^{-4}}\leq1.0$$

Note.—For Tier I, all chromium in the waste is treated as hexavalent chromium (Cr+6).

First (As), (Cd), and (Cr) in units of lb/MM Btu, must be determined for the waste using the following equation(s):

$$(M)=\frac{Cm\ (10^{6}\ Btu)(10^{-6}\ lbs/ppm)}{Hw}$$

which simplifies to:

$$(2)\ (M)=\frac{Cm}{Hw}$$

where:

(M) is the metal feedrate in the waste in lb/MM Btu.
Cm is the metal concentration in the waste in ppm.
Hw is the heat content of the waste in Btu/lb.

Therefore:

$$(As)=\frac{0.5}{10^{4}}=5\times10^{-5}\ lb/MM\ Btu$$

$$(Cd)=\frac{1.0}{10^{4}}=1\times10^{-4}\ lb/MM\ Btu$$

$$(Cr)=\frac{0.4}{10^{4}}=4\times10^{-5}\ lb/MM\ Btu$$

Substituting in equation #1:

$$\frac{5\times10^{-5}}{3.9\times10^{-4}}+\frac{1\times10^{-4}}{9.8\times10^{-4}}+\frac{4\times10^{-5}}{1.4\times10^{-4}}=$$

$0.13+0.10+0.28=0.52\leq1.0$

Therefore, the facility is in compliance with Tier I standards for arsenic, cadmium, and chromium.

As for lead, using equation #2:

$$(Pb)=\frac{10}{10^{4}}=1\times10^{-3}\ lb/MM\ Btu$$

From proposed § 266.34-4(b)(3)(i)(B), maximum lead levels are 1.6×10^{-2} lb/MM Btu. Therefore, the facility is in compliance with the all Tier I metal standards. Note: It is proposed that the specific levels for the metals will be fixed in the final permit based on the characteristics of the waste and equation #1.

Example #2 (Tier II)

The above boiler is burning a hazardous waste under the same conditions as example #1 except the hazardous waste has the following metals concentrations:

Arsenic=2.0 ppm
Cadmium=1.0 ppm
Chromium=0.4 ppm
Lead=20 ppm

Question: Would the boiler be in compliance with Tier II standards when burning fuel oil containing the following metals:

Arsenic=0.5 ppm
Cadmium=0.2 ppm
Chromium=0.2 ppm
Lead=1.0 ppm

In this case, the following equation for Tier II (from proposed § 266.34-4(b)(2)) must be used to calculate the metal feed rate (MFR):

$$(3) \qquad MFR = \frac{Mw \times Rw + \sum_{i=1}^{N} M_{Fi} \times R_{Fi} + \sum_{j=1}^{N} M_{FSj} \times R_{FSj}}{H_T} \times 10^{-6}$$

For this case the equation can be simplified to the following:

$$(4) \quad MFR = \frac{Mw \times Rw + M_{F1} \times R_{F1}}{H_T} \times 10^{-6}$$

where:

MFR means the individual metal feed rate in pounds/million Btu of total heat input to the device.

Mw means individual metal concentration in the hazardous waste in ppm.

Rw means the hazardous waste feed rate in pounds/hour.

M_{F1} means the concentration of metal in the other fuel, F1, in ppm.

R_{F1} means the feed rate for the other fuel, F1, in pounds/hour.

H_T means the total heat input to the device in million Btu/hour.

Therefore, substituting in equation #4

$$(As) = \frac{2.0 \times 150 \text{ lbs/hr} + 0.5 \times 400 \text{ lbs/hr}}{10 \text{ million Btu/hr}} \times 10^{-6}$$

$=5 \times 10^{-5}$ lb/MM Btu
$(Cd)=2.1 \times 10^{-5}$ lb/MM Btu
$(Cr)=1.4 \times 10^{-5}$ lb/MM Btu

and then substituting in equation #1:

$$\frac{5.0 \times 10^{-5}}{3.9 \times 10^{-4}} + \frac{2.1 \times 10^{-5}}{9.8 \times 10^{-4}} + \frac{1.4 \times 10^{-5}}{1.4 \times 10^{-4}} =$$

$0.128+0.02+0.10=0.25<1.0$

The facility is in compliance with the Tier 11 requirements for arsenic, chromium, and cadmium.

For lead, using equation #4

$$(Pb) = \frac{2.0 \times 150 + 0.5 \times 4\ 00}{10} \times 10^{-6}$$

$=3.4 \times 10^{-4}$ lb/MM Btu

which is also in compliance with the 1.6×10^{-2} lb/MM Btu lead standard.

For the reasons set out 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: Secs. 1006, 2002, 3001 through 3007, 3010, and 7004, Solid Waste Disposal Act, as amended by the Resource Conversation and Recovery Act of 1976, as amended, 42 U.S.C. 6905, 6912, 6921 through 6927, 6930, and 6974.

2. It is proposed to amend the definition of "Industrial Furnace" in § 260.10 by redesignating paragraph (12) as (13) and by adding a new paragraph (12) to read as follows:

§ 260.10 Definitions.

* * * * *

"Industrial furnace" * * *

(12) Halogen acid furnaces for the production of acid from halogenated secondary materials generated at chemical production facilities where the furnace is located on-site and the acid product has a halogen acid content of at least 6%.

* * * * *

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

§ 260.11 References.

(a) * * *

"Guidelines for Permit Writers: Permitting Hazardous Waste Combustion Facilities Using Risk Assessment".

* * * * *

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: Secs. 1006, 2002(a), 3001, and 3002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912(a), 6921, and 6922).

2. Section 261.32 is amended by revising the entry under "iron and steel" for the hazardous waste listing K062 to read as follows:

§ 261.32 Hazardous wastes from specific sources.

* * * * *

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
Iron and Steel:		
* * *		
K062	Spent pickle liquor generated by steel finishing operations of facilities within the iron and steel industry (SIC Codes 331 and 332).	(C, T)

* * * * *

3. It is proposed to amend § 261.4 by adding paragraph (a)(9) to read as follows:

§ 261.4 Exclusions.

(a) * * *

(9) Coke and coal tar from the iron and steel industry that contains or is

produced from decanter tank tar sludge, EPA Hazardous Waste K087.

* * * * *

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: Secs. 1006, 2002(a), 3004, 3005 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912(a), 6924, and 6925).

2. It is proposed to amend § 264.340 by revising paragraph (a) to read as follows:

§ 264.340 Applicability.

(a) The regulations of this subpart apply to owners and operators of hazardous waste incinerators (as defined in § 260.10 of this chapter), except as § 264.1 provides otherwise.

* * * * *

PART 265—INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

IV. In Part 265:

1. The authority citation for Part 265 continues to read as follows:

Authority: Secs. 1006, 2002(a), 3004, and 3005 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6924, and 6925).

2. It is proposed to amend § 265.340 by revising paragraph (a) to read as follows:

§ 265.340 Applicability.

(a) The regulations of this subpart apply to owners and operators of hazardous waste incinerators (as defined in § 260.10 of this chapter), except as § 265.1 provides otherwise.

* * * * *

PART 266—STANDARDS FOR THE MANAGEMENT OF SPECIFIC WASTES AND SPECIFIC TYPES OF WASTE MANAGEMENT FACILITIES

V. In Part 266:

1. The authority citation for Part 266 continues to read as follows:

Authority: Secs. 1006, 2002(a), 3004, and 3014 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912(a), 6924, and 6934).

2. It is proposed to revise Subpart D to read as follows:

Subpart D—Hazardous Waste Burned in Boilers and Industrial Furnaces

§ 266.30 Applicability.

(a) The regulations of this subpart apply to hazardous waste burned in a boiler or industrial furnace (as defined in § 260.10 of this chapter), except as provided by paragraph (b) of this section. A secondary material burned in an industrial furnace exclusively for materials recovery is not a solid (and if hazardous, hazardous) waste, however, if it is indigenous to the process in which the industrial furnace is used, in the sense of being generated by the same type of industrial furnace as that in which burning occurs, or, for secondary smelting furnaces, the material is scrap metal or battery plates and groups. These regulations also do not apply to gas recovered from hazardous (or solid) waste landfills when such gas is burned for energy recovery.

(b) The following hazardous wastes and facilities are not subject to regulation under this subpart:

(1) Used oil burned for energy recovery that is also a hazardous waste solely because it exhibits a characteristic of hazardous waste identified in Subpart C of Part 261 of this chapter. Such used oil is subject to regulation under Subpart E of Part 266 rather than this subpart; and

(2) Hazardous wastes that are exempt from regulation under §§ 261.4 and 261.6 (a)(3)(v)–(ix) of this chapter, and hazardous wastes that are subject to the special requirements for small quantity generators under § 261.5 of this chapter.

§ 266.31 Standards for generators.

Generators of hazardous waste that is burned in a boiler or industrial furnace are subject to Part 262 of this chapter. Generators who burn such hazardous waste also are subject to §§ 266.34 and 266.35.

§ 266.32 Standards for transporters.

Transporters of hazardous waste that is burned in a boiler or industrial furnace are subject to Part 263 of this chapter.

§ 266.33 Standards for owners and operators of treatment or storage facilities.

(a) Owners and operators of facilities that treat or store hazardous waste that is burned in a boiler or industrial furnace are subject to the applicable provision of Subparts A through L of Part 264, Subparts A through L of Part 265, and Part 270 of this chapter, except as provided by paragraph (b) of this section. These standards apply to storage by the burner as well as to storage and treatment facilities operated by intermediaries (processors, blenders, distributors, etc.) between the generator and the burner.

(b) Owners and operators of facilities that burn, in an on-site boiler or industrial furnace exempt from regulation under the small quantity burner provisions of § 266.34–1(b), hazardous waste that they generate are exempt from regulation under Subparts A through L of Part 264, Subparts A through L of Part 265, and Part 270 of this chapter with respect to the storage of mixtures of hazardous waste and the boiler or industrial furnace primary fuel in tanks that feed the fuel mixture directly to the boiler. Storage of hazardous waste prior to mixing with the primary fuel is subject to regulation as prescribed in paragraph (a) of this section.

§ 266.34 Standards for owners and operators of facilities that burn hazardous waste in a boiler or industrial furnace.

§ 266.34-1 Applicability.

(a) *General*. Owners and operators of facilities that burn hazardous waste in a boiler or industrial furnace are subject to this section except as provided by § 266.30 and paragraphs (b) and (c) of this section.

(b) *Small quantity on-site burner exemption.* Owners and operators of facilities that burn hazardous waste that they generate in an on-site boiler, blast furnace, sulfur recovery furnace, light-weight aggregate kiln, asphaltic concrete kiln, lime kiln, or cement kiln are exempt from the requirements of this section provided that:

(1) The quantity of hazardous waste burned in a calendar month does not exceed the limits provided below as a function of device size. No more than one type of device may burn hazardous waste at a given site under this exemption, and the number of devices of each type that can burn waste at a given site are limited (i.e., hazardous waste may be burned at a given site under only one of the following paragraphs, (b)(1) (i) through (viii) of this section, and only in the maximum number of devices precribed for that paragraph). The size of the boiler or industrial furnace means maximum rated heat input capacity.

(i) *Boilers:*

Boiler size (million Btu/hr)	Quantity limit/device (gallon/month)
0.4 to 1.5	7
>1.5 to 10	13
>10 to 50	26
>50 to 150	55
>150 to 400	100
>400	300

No more than two boilers may burn hazardous wastes under this exemption at a site.

(ii) *Blast furnaces:*

Blast furnace size (million Btu/hr)	Quantity limit/device (gallon/month)
500 to 1,400	250
>1,400	420

No more than two blast furnaces may burn hazardous wastes under this exemption at a site.

(iii) *Sulfur recovery furnaces:*

Furnace size (million Btu/hr)	Quantity limit/device (gallon/month)
>50	40

No more than four sulfur recovery furnaces may burn hazardous wastes under this exemption at a site.

(iv) *Asphaltic concrete kilns:*

Kiln size (million Btu/hr)	Quantity limit/device (gallon/month)
>18	110

No more than one asphaltic concrete kiln may burn hazardous wastes under this exemption at a site.

(v) *Lime kilns:*

Kiln size (million Btu/hr)	Quantity limit/device (gallon-month)
>60	200

No more than two lime kilns may burn hazardous wastes under this exemption at a site.

(vi) *Light-weight aggregate kilns:*

Kiln size (million Btu/hr)	Quantity limit/device (gallon-month)
>45	110

No more than three light weight aggregate kilns may burn hazardous wastes under this exemption at a site.

(vii) *Wet cement kilns:*

Kiln size (million Btu/hr)	Quantity limit/device (gallon/month)
90 to 200	170
>200	420

No more than three wet cement kilns may burn hazardous wastes under this exemption at a site.

(viii) *Dry cement kilns:*

Kiln size (million Btu/hr)	Quantity limit/device (gallon-month)
60 to 160	140
>160	280

No more than three dry cement kilns may burn hazardous wastes under this exemption at a site.

(2) The hazardous waste fuel does not contain (and is not derived from) EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, or F027.

(3) The maximum hazardous waste firing rate cannot exceed at any time 1 percent of the total boiler or industrial furnace fuel (hazardous waste plus other fuel) on a volume basis.

Note.—Hazardous wastes that are subject to the special requirements for small quantity generators under § 261.5 of this chapter may be burned in an off-site device under the exemption provided by § 266.34–1(b), but must be included in the quantity determination of the exemption.

(4) *Notification requirements.* The owner/operator of facilities qualifying for the on-site small quantity burner exemption under paragraphs (b) (1), (2), and (3) of this section must provide a one-time written notice to EPA indicating the following:

(i) The combustion unit is operating as a small quantity burner of hazardous waste;

(ii) The requirements of § 266.34–1 and any other applicable standards providing for their status as a small quantity burner will be complied with at all times; and

(iii) Hazardous waste generated off-site (other than small quantity generator hazardous waste exempt under § 261.5 of this chapter) will not be burned;

(5) *Recordkeeping requirements.* The owner or operator must maintain the following records at the site to show compliance with this subsection:

(i) Sufficient records to show compliance with the hazardous waste quantity and firing rate limits must be maintained at the facility for three years;

(ii) These records, at a minimum, must indicate the device capacity size and the quantity of hazardous waste and other fuel burned in each unit per month.

(c) *Applicability of Part 264 standards.* Owners and operators of boilers and industrial furnaces that burn hazardous waste are subject to the following provisions of Part 264 of this chapter, except as provided otherwise by this section:

(1) In Subpart A (General), § 264.4;

(2) In Subpart B (General facility standards), §§ 264.11–264.18;

(3) In Subpart C (Preparedness and prevention), §§ 264.31–264.37;

(4) In Subpart D (Contingency plan and emergency procedures), §§ 264.51–264.56;

(5) In Subpart E (Manifest system, recordkeeping, and reporting), §§ 264.71–264.77, except that §§ 264.71, 264.72, and 264.76 do not apply to owners and operators of on-site facilities that do not receive any hazardous waste from off-site sources;

(6) In Subpart F (Corrective Action), §§ 264.90 and 264.101.

(7) In Subpart G (Closure and post-closure), §§ 264.111–264.115; and

(8) In Subpart H (Financial requirements), §§ 264.141, 264.142, 264.143, and 264.147–264.151, except that States and the Federal government are exempt from the requirements of Subpart H.

§ 266.34–2 Hazardous waste analysis.

(a) The owner or operator must provide an analysis of the hazardous waste that quantifies the concentration of any constituent identified in Appendix VIII of Part 261 of this chapter that may reasonably be expected to be in the waste. Such constituents must be identified and quantified if present, at levels detectable by analytical procedures prescribed by EPA Publication SW–846 referenced in § 260.11 of this chapter. This analysis will be used to provide all information required by this section and §§ 270.22 and 270.65 of this chapter and to enable the permit writer to prescribe such permit conditions as necessary to protect human health and the environment under authority of section 3005(c) of the Hazardous and Solid Waste Amendment (HSWA). Such analysis must be included as a portion of the Part B permit application, or, for facilities operating under the interim status standards of § 266.35, as a portion of the trial burn plan that may be submitted before the Part B application under provisions of § 270.65(d) of this chapter as well as any other analysis required by the permit authority in preparing the permit. Owners and operators of boilers and industrial furnaces not operating under the interim status standards of § 266.35 must provide the information required by §§ 270.22 or 270.65(c) of this chapter to the greatest extent possible.

(b) Throughout normal operation, the owner or operator must conduct sufficient analyses to ensure that the hazardous waste fired to the boiler or industrial furnace is within the physical and chemical composition limits specified in his permit.

§ 266.34-4 Standards to control emissions.

A boiler or industrial furnace burning hazardous waste must be designed, constructed, and maintained so that, when operated in accordance with operating requirements specified under § 266.34-6, it will meet the following standards:

(a) *Organic emissions.* A boiler or industrial furnace burning hazardous waste must meet the DRE performance standard of paragraph(a)(1) of this subsection and the stack gas carbon monoxide standard of paragraph (a)(2) of this section, except as provided by paragraph(a)(3) of this section. A boiler operated under the special conditions provided by paragraph (a)(4) of this section is deemed to be in compliance with the DRE performance standard of paragraph (a)(1) of this section without conducting a trial burn.

(1) *DRE standard.* (i) Except as provided in paragraph (a)(1)(iii) of this section, a boiler or industrial furnace burning hazardous waste must achieve a destruction and removal efficiency (DRE) of 99.99% for each principal organic hazardous constituent (POHC) designated (underparagraph (a)(1)(ii) of this section) in its permit for each hazardous equation:

$$DRE = \frac{W_{in} - W_{out}}{W_{in}} \times 100\%$$

where:

W_{in}=Mass feed rate of one principal organic hazardous constituent (POHC) in the hazardous waste fired to the boiler or industrial furnace, and

W_{out}=Mass emission rate of the same POHC present in exhaust emissions prior to release to the atmosphere.

(ii) Principal organic hazardous constituents (POHCs) are designated as follows:

(A) One or more POHCs will be specified in the facility's permit, from among those constituents listed in Part 261, Appendix VIII of this chapter, for each hazardous waste to be burned. This specification will be based on the degree of difficulty of combustion of the organic constituents in the hazardous waste and on their concentration or mass in the hazardous waste, considering the results of hazardous waste analyses and trial burns or alternative data submitted with Part B of the facility's permit application. Organic constituents which represent the greatest degree of difficulty of combustion will be those most likely to be designated as POHCs. Constituents are more likely to be designated as POHCs if they are present in large quantities or concentrations in the waste.

(B) Trial POHCs will be designated for performance of trial burns in accordance with the procedure specified in § 270.65 of this chapter for obtaining trial burn permits.

(iii) A boiler or industrial furnace burning hazardous waste containing (or derived from) EPA hazardous wastes F020, F021, F022, F023, F026, or F027 must achieve a destruction and removal efficiency (DRE) of 99.9999% for each principal organic hazardous constituent (POHC) designated (under paragraph (a)(1)(ii) of this section) in its permit. This performance must be demonstrated on POHCs that are more difficult to burn than tetra-, penta-, and hexachlorodibenzo-*p*-dioxins and dibenzofurans. DRE is determined for each POHC from the equation in paragraph (a)(1) of this section. In addition, the owner or operator of the boiler or industrial furnace must notify the Regional Administrator of his intent to burn EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, or F027.

(2) *Carbon monoxide standard.* (i) A boiler or industrial furnace burning hazardous waste must be operated so that carbon monoxide (CO) levels in the stack gas do not exceed the time-weighted average limits provided below. If a limit is exceeded, the hazardous waste feed must be shutoff within the time specified:

CO limit (7 percent O_2)	If exceeded, shutoff hazardous waste feed:
100 ppm average over any 60 minute period.	Within 10 minutes.
500 ppm average over any 10 minute period.	Immediately.

When the stack gas oxygen content differs from 7 percent, measured CO levels must be corrected to those levels that would result if the stack gas oxygen content were 7 percent.

(ii) Hazardous waste burning may not resume until the device has resumed steady-state (normal) operations as evidenced by maintaining a time-weighted average carbon monoxide (CO) level not to exceed 100 ppm for an averaging period of not less than 10 minutes nor more than 60 minutes.

(iii) If the CO limits provided by paragraph (a)(2)(i) of this section are exceeded an aggregate of 10 times in a calendar month, the owner or operator:

(A) Must cease burning hazardous waste:

(B) Must notify the Regional Administrator in writing within 5 calendar days: and

(C) May not resume burning hazardous waste unless and until written authorization is received from the Regional Administrator.

(iv) Carbon monoxide and oxygen levels in the stack gas must be monitored in accordance with § 266.34-7.

(v) The boiler or industrial furnace must be operated with a functioning system that automatically cuts off the hazardous waste feed when the 500 ppm, 10 minute time-weighted average CO limit is exceeded.

(3) *Provision for low risk waste.* The DRE and CO standards of paragraphs (a)(1) and (a)(2) of this section do not apply if the boiler or industrial furnace is operated in conformance with paragraph (a)(3)(i) of this section, and the owner or operator demonstrates by emissions modeling in conformance with paragraph (a)(3)(ii) of this section that the burning will not result in significant adverse health effects.

(i) The device is operated as follows:

(A) A minimum of 50 percent of the fuel fired to the device is one or more of the fossil fuels: oil, natural gas, or coal, or fuels derived from those fossil fuels. The fossil fuel firing rate must be determined on a total heat or volume input basis, whichever results in the smaller volume of fossil fuel fired:

(B) The hazardous waste has an as-fired heating value of at least 8,000 Btu/lb; and

(C) The hazardous waste is fired directly into the flame zone of the combustion chamber.

(ii) The burning will be considered to result in insignificant adverse health effects if the owner or operator conducts the following demonstrations in conformance with the procedures prescribed in "Guidelines for Permit Writers: Permitting Hazardous Waste Combustion Facilities Using Risk Assessment" (incorporated by reference, see § 260.11 of this chapter). This document is herein referred to as the Risk Assessment Guideline (RAG).

(A) Identify and quantify those organic constituents listed in Appendix VIII of 40 CFR Part 261 that could reasonably be expected to be in the hazardous waste. To be eligible for the waiver, every Appendix VIII organic constituent identified in the waste must be listed in the RAG where a reference air concentration (RAC) for noncarcinogenic compounds or a risk specific dose (RSD) carcinogenic compound is provided. (The owner or operator may petition the Administrator under provisions provided by § 260.20 of this chapter to list other hazardous constituents in the RAG or to revise RACs or RSDs for compounds listed in the RAG. Such petitions must include supporting health effects data.)

(B) Calculate reasonable, worst-case emission rates for each constituent identified in paragraph (a)(3)(ii)(A) of this section by assuming the device achieves a 99 percent destruction and removal efficiency:

(C) Calculate reasonable, worst case emission rates of products of incomplete combustion (PICs) for each constituent identified in paragraph (a)(3)(ii)(A) of this section under procedures prescribed in the RAG.

(D) For noncarcinogenic constituents, use emissions modeling in conformance with § 270.22 of this chapter to demonstrate that emissions do not result in an exceedance of the reference air concentrations (RACs) established by the RAG.

(E) For carcinogenic constituents, use emission modeling in conformance with § 270.22 of this chapter and the risk-specific doses identified in the RAG to demonstrate that emissions of the carcinogenic constituents and emissions of PICs estimated in conformance with paragraphs (a)(3)(ii) (B) and (C) of this section do not result in maximum off-site annual average ground level concentrations that would pose an aggregate risk to an exposed individual of greater than 1×10^{-5} (1 in 100,000) using the following equation:

$$\sum_{i=1}^{N} \frac{C_{ci}}{RSD_{ci}} + \frac{C_p}{RSD_p} \leq 1$$

where:

$\sum_{i=1}^{N}$ means the sum of all values for all carcinogenic constituents, from the first constituent, 1, to the Nth constituent, N.

C_{ci} means predicted maximum annual average ground level concentration of constituent, i, in ug/m^3.

RSD_{ci} means risk-specific dose at 10^{-5} risk for constituent, i, in ug/m^3.

C_p means predicted maximum annual average ground level concentration of PICs, in ug/m^3.

RSD_p means risk-specific dose at 10^{-5} risk for PICs, in ug/m^3.

(4) *Boilers operated under special operating requirements in lieu of a trial burn.* Boilers operated under the following special operating requirements, and that do not burn hazardous waste containing (or derived from) EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, or F027, are considered to be in conformance with the organic emissions performance standard of § 266.34–4(a), and a trial burn to demonstrate DRE is waived. When burning hazardous waste:

(i) A minimum of 50% of the fuel fired to the boiler is any of the following fossil fuels: oil, natural gas, or coal, or fuels derived from those fossil fuels. The fossil fuel firing rate must be determined on a total heat or volume input basis, whichever results in the smaller volume of fossil fuel fired;

(ii) Boiler load is equal to or greater than 25%. Boiler load is the ratio at any time of the total heat input to the maximum design heat input;

(iii) The hazardous waste has an as-fired heating value of at least 8,000 Btu/lb; and

(iv) The hazardous waste is fired directly into the flame zone of the combustion chamber with an air or steam atomization firing system, a mechanical atomization system, or a rotary cup atomization system under the following restrictions on the as-fired viscosity and maximum particle size of the hazardous waste:

Atomization system	Hazardous waste viscosity limits	Hazardous waste maximum particle size (mesh)
High pressure air or steam atomization (>30 psig).	150 to 5,000 SSU	200
Low pressure air or steam atomization (<30 psig).	200 to 1,500 SSU	200
Mechanical atomization.	<150 SSU	200
Rotary cup atomization.	175 to 300 SSU	100

SSU: Seconds, Saybolt Universal.

(A) *Mechanical atomization systems.* Fuel pressure within a mechanical atomization system and fuel flow rate must be maintained within the design range taking into account the viscosity and volatility of the fuel.

(B) *Rotary cup atomization systems.* Fuel flow rate through a rotary cup atomization system must be maintained within the design range taking into account the viscosity and volatility of the fuel.

(v) Stack gas carbon monoxide levels do not exceed the standard provided by § 266.34–4(a)(2).

(b) *Metals.* The owner or operator must comply with the metals controls provided by paragraphs (b)(1), (b)(2), (b)(3), or (b)(4) of this section. Standards are provided in each of those paragraphs according to the type and location of the device. Devices located where any part of the surrounding terrain within 20 kilometers of the stack equals or exceeds the elevation of the stack are considered to be in complex terrain and the complex terrain standards apply. For the purpose of this determination, the stack may not exceed good engineering practice as specified in 40 CFR Part 51. All other devices are considered to be in flat terrain and flat terrain standards apply. The standards apply to a single site and are not to be exceeded at any time. If there is more than one device on a site, the limits for the largest device must be apportioned among the devices based on the thermal capacity of the devices at the site. The following definitions apply:

(As) Means level of total arsenic in pounds/million Btu;

(Cd) Means level of total cadmium in pounds/million Btu;

(Cr+6) Means level of hexavalent chromium in pounds/million Btu; and

(Pb) Means level of lead in pounds/million Btu

(1) *Tier I.* The hazardous waste must not contain arsenic, cadmium, chromium, and lead at levels greater than allowed by paragraphs (b)(3) (i) or (ii) of this section. The concentration limits are based on the heating value of the hazardous waste in terms of pounds of metal per million Btu of waste heating value (lb/MM Btu). The limits apply to the hazardous waste directly or as-fired after any blending with other waste or fuel. Hazardous waste exceeding any specification level is "off-specification". For purposes of compliance with this paragraph with respect to chromium, total chromium levels rather than hexavalent chromium levels must be considered in applying the limits provided by paragraphs (b)(3) (i) and (ii) of this section; or

(2) *Tier II.* The feed rate of arsenic, cadmium, chromium, and lead to the device considering the metals contained in the hazardous waste, other fuels, and industrial furnace feedstocks shall not exceed limits resulting from applying the limits provided by paragraphs (b)(3) (i) or (ii) of this section as follows:

(i) For each metal, use the following equation to determine the feed rate of the metal to the device in terms of lb/MM Btu of total heat input:

$$MFR = \frac{Mw \times Rw + \sum_{i=1}^{N} M_{Fi} \times R_{Fi} + \sum_{j=1}^{N} M_{FSj} \times R_{FSj}}{H_T} \times 10^{-6}$$

Where:

MFR means the individual metal feed rate in pounds/million Btu of total heat input to the device.

Mw means individual metal concentration in the hazardous waste in ppm.

Rw means the hazardous waste feed rate in pounds/hour.

$\sum_{i=1}^{N}$ means the sum of all values for the other fuels (other than hazardous waste) from, i=1, to the Nth fuel.

M_{Fi} means the concentration of metal in the other fuel, Fi, in ppm.

R_{Fi} means the feed rate for the other fuel, Fi, in pounds/hour.

$\sum_{j=1}^{N}$ means, for industrial furnaces, the sum of all the values for all feedstocks from the first, j=1, to the Nth feedstock.

M_{FSj} means the concentration of metal in the feedstock, FSj, in ppm.

R_{FSj} means the quantity of feedstock, FSj, charged to the industrial furnace in pounds/hour.

H_T means the total heat input to the device in million Btu/hour.

and

(ii) Use the feed rates determined by paragraph (b)(2)(i) of this section in lieu of metals emission rates to show that the limits provided by paragraphs (b)(3) (i) and (ii) of this section are not exceeded. For purposes of compliance with this paragraph with respect to chromium, the total chromium feed rate determined by this paragraph is to be considered in lieu of hexavalent chromium when applying the limits provided by paragraphs (b)(3) (i) and (ii).

;or

(3) *Tier III.* Stack emission rates of each of the following metals must not exceed the limits specified below. The limits are based on the instantaneous total heat input to the device.

(i) Flat terrain standards:

(A) *Category 1:* Sulfur recovery furnaces, asphaltic concrete kilns, blast furnaces, and halogen acid furnaces:

$$\frac{(As)}{1.0 \times 10^{-4}} + \frac{(Cd)}{2.5 \times 10^{-4}} + \frac{(Cr+6)}{3.7 \times 10^{-5}} \leq 1.0$$

(Pb) shall not exceed 4.1×10^{-3} pounds/million Btu.

(B) *Category 2:* Light-weight aggregate kilns, lime kilns, and boilers:

$$\frac{(As)}{3.9 \times 10^{-4}} + \frac{(Cd)}{9.8 \times 10^{-4}} + \frac{(Cr+6)}{1.4 \times 10^{-4}} \leq 1.0$$

(Pb) shall not exceed 1.6×10^{-2} pounds/million Btu.

(C) *Category 3:* Cement kilns, wet and dry:

$$\frac{(As)}{1.7 \times 10^{-3}} + \frac{(Cd)}{4.3 \times 10^{-3}} + \frac{(Cr+6)}{6.3 \times 10^{-4}} \leq 1.0$$

(Pb) shall not exceed 6.7×10^{-2} pounds/million Btu.

(ii) Complex terrain standards:

(A) *Category 1:* Blast furnaces:

$$\frac{(As)}{1.3 \times 10^{-5}} + \frac{(Cd)}{3.3 \times 10^{-5}} + \frac{(Cr+6)}{4.9 \times 10^{-5}} \leq 1.0$$

(Pb) shall not exceed 5.3×10^{-4} pounds/million Btu.

(B) *Category 2:* Sulfur recovery furnaces:

$$\frac{(As)}{3.9 \times 10^{-5}} + \frac{(Cd)}{9.9 \times 10^{-5}} + \frac{(Cr+6)}{1.4 \times 10^{-4}} \leq 1.0$$

(Pb) shall not exceed 1.6×10^{-3} pounds/million Btu.

(C) *Category 3:* Asphatic concrete kilns, boilers, light-weight aggregate kilns, lime kilns, and halogen acid furnaces:

$$\frac{(As)}{5.9 \times 10^{-5}} + \frac{(Cd)}{1.6 \times 10^{-4}} + \frac{(Cr{+}6)}{2.2 \times 10^{-4}} \leq 1.0$$

(Pb) shall not exceed 2.4×10^{-3} pounds/ million Btu.

(D) *Category 4:* Cement kilns, wet and dry processes:

$$\frac{(As)}{1.2 \times 10^{-4}} + \frac{(Cd)}{3.0 \times 10^{-4}} + \frac{(Cr{+}6)}{4.5 \times 10^{-4}} \leq 1.0$$

(Pb) shall not exceed 4.7×10^{-3} pounds/ million Btu.

;or

(4) *Tier IV.* For arsenic, cadmium, and chromium, the sum of the products of the predicted maximum off-site annual average ground level concentration times the unit risk for each metal shall not exceed 1.0. Unit risk values are provided in the RAG. For lead, the predicted maximum quarterly average ground level concentration shall not exceed 0.15 $\mu g/m^3$. Conformance with this standard is demonstrated by dispersion modeling of stack emissions in conformance with § 270.22(d) of this chapter. All boilers and furnaces not specifically identified in paragraphs (b)(1), (b)(2), or (b)(3) of this section must comply with the requirements of this paragraph.

(c) *Hydrogen chloride (HCl).* The owner or operator must comply with the hydrogen chloride (HCl) controls provided by paragraphs (c)(1), (c)(2), (c)(3), or (c)(4) of this section. Standards are provided in each of those paragraphs according to the type and location of the device. Devices located where any part of the surrounding

(1) *Tier I.* The hazardous waste must not contain chlorine at levels greater

terrain within 20 kilometers of the stack equals or exceeds the elevation of the stack are considered to be in complex terrain and the complex terrain standards apply. For the purpose of this determination, the stack may not exceed good engineering practice as specified in 40 CFR Part 51. All other devices are considered to be in flat terrain and flat terrain standards apply. The standards apply to a single site and are not to be exceeded at any time. If there is more than one device on a site, the limits for the largest device must be apportioned among the devices based on the thermal capacity of the devices at the site.

than allowed by paragraph (c)(3) (i) or (ii) of this subsection. The concentration limits are based on the heating value of the hazardous waste in terms of pounds of chlorine pêr million Btu of waste heating value (lb/MM Btu). The limits apply to the hazardous waste directly or as-fired after any blending with other waste or fuel. Hazardous waste exceeding the specification level is "off-specification".

(2) *Tier II.* The feed rate of chlorine to the device considering the chlorine contained in the hazardous waste, other fuels, and industrial furnace feedstock shall not exceed limits provided by paragraphs (c)(3) (i) and (ii) of this section as follows:

(i) Use the following equation to determine the feed rate of chlorine to the device in terms of lb/MM Btu of total heat input:

$$CFR = \frac{C_w \times R_w + \sum_{i=1}^{N} C_{Fi} \times R_{Fi} + \sum_{j=1}^{N} C_{FSj} \times R_{FSj}}{H_T} \times 10^{-6}$$

Where:

CFR means total chlorine feed rate in pounds/MM Btu of total heat input to the device.

C_w means chlorine concentration in the hazardous waste in ppm.

R_w means the hazardous waste feed rate in pounds/hour.

$\sum_{i=1}^{N}$ means the sum of all values for the other fuels (other than hazardous waste) from, i=1, to the Nth fuel.

C_{Fi} means the chlorine concentration in the other fuel, Fi, in ppm.

R_{Fi} means the feed rate of the other fuel, Fi, in pounds/hour.

$\sum_{j=1}^{N}$ means, for industrial furnaces, the sum of all of the values for all feedstocks from the first, j=1, to the Nth feedstock.

C_{FSi} means the chlorine concentration in feedstock, FSi, in ppm.

R_{FSi} means the quantity of feedstock, FSi, charged to the industrial furnace in pounds/hour.

H_T means the total heat input to the device in million Btu/hr.

and

(ii) Use the feed rates determined by paragraph (c)(2)(i) of this section in lieu of the chlorine emission rates to show that the limits provided by paragraphs (c)(3) (i) or (ii) of this section are not exceeded.

; or

(3) *Tier III.* The stack emission rate of HCl must not exceed the limits specified below. The limits are based on the instantaneous total heat input to the device.

(i) Flat terrain standards:

(A) *Category 1:* Sulfur recovery furnaces and halogen acid furnaces: 0.18 lb/million BTU.

(B) *Category 2:* Blast furnaces and asphaltic concrete kilns: 0.32 lb/million BTU.

(C) *Category 3:* Light-weight aggregate kilns, boilers, and lime kilns: 0.70 lb/million BTU.

(D) *Category 4:* Cement kilns, wet and dry: 1.8/million BTU.

(ii) Complex terrain standards:

(A) *Category 1:* Blast furnaces: 2.5×10^{-2} lb/million BTU.

(B) *Category 2:* Sulfur recovery furnaces: 4.1×10^{-2} lb/million BTU.

(C) *Category 3:* Asphaltic concrete kilns, light-weight aggregate kilns, boilers, halogen acid furnaces, and lime kilns: 7.3×10^{-2} lb/million BTU.

(D) *Category 4:* Cement kilns, wet and dry processes: 0.21 lb/million BTU.

(4) *Tier IV.* The predicted maximum off-site annual average and maximum off-site 3-minute ground level concentrations of HCl attributable to stack emissions from the boiler or industrial furnace must not exceed 15 $\mu g/m^3$ and 150 $\mu g/m^3$, respectively. Conformance with this standard is demonstrated by dispersion modeling of stack emission in conformance with § 270.22(e) of this chapter. All boilers and industrial furnaces not specifically identified in paragraphs (c)(1), (c)(2), or (c)(3) of this section must comply with the requirements of this paragraph.

(d) For purposes of permit enforcement, compliance with the operating requirements specified in the permit (under § 266.34–6) will be regarded as compliance with this subsection. However, evidence that compliance with those permit conditions is insufficient to ensure compliance with the requirements of this subsection may be "information" justifying modification, revocation, or reinsurance of a permit under § 270.41 of this chapter.

§ 266.34–5 Permits.

(a) The owner or operator of a boiler or industrial furnace may burn only hazardous wastes specified in his permit and only under the operating conditions specified for those hazardous wastes under § 266.34.6, except in approved trial burns under the conditions specified in § 270.65 of this chapter.

(b) Other hazardous wastes may be burned only under a new permit or permit modification, as applicable, that specifies the operating requirements as provided by § 266.34 6.

(c) Boilers and industrial furnaces operating under the interim status standards of § 266.35 are permitted under procedures provided by § 270.65 of this chapter.

(d) A permit for new boilers and industrial furnaces (those boilers and industrial furnaces not operating under the interim status standards of § 266.35) must establish appropriate conditions for each of the applicable requirements of this subsection, including but not limited to allowable hazardous waste firing rates and operating conditions necessary to meet the requirements of § 266.34–6, sufficient to comply with the following standards:

(1) Boilers that will be permitted without conducting a trial burn because they operate under the special operating conditions provided by § 266.34–4(a)(4) (that ensure compliance with the organic emissions standard), and burn hazardous waste containing metals and chlorine at concentrations in conformance with the limits provided by §§ 266.34–4(b) (1) or (2) and 266.34–4(c) (1) or (2) (that ensure compliance with the metals and hydrogen chloride standards) are subject to the following permits and are said to be operating under Special Operating Requirements:

(i) For the period beginning with initial introduction of hazardous waste to the boiler and for the minimum time required, not to exceed a duration of 720 hours operating time when burning hazardous waste, to bring the boiler to a point of operational readiness, the boiler must be operated in conformance with the Standard Operating Requirements. The Regional Administrator may extend the duration of this period once for up to 720 additional hours when good cause for the extension is demonstrated by the aplicant.

(ii) For the period immediately after completion of the first period of operation and only for the minimum period sufficient to allow sample analysis, data computation, and submission of the results by the applicant demonstrating conformance with the Special Operating Requirements, the boiler is subject to the Special Operating Requirements.

(iii) For the remaining duration of the permit, the boiler is subject to the Special Operating Requirements. If the hazardous waste is off-specification for metals or chlorine, the Regional Administrator will specify limitations, as appropriate, on the metals and chlorine content, heating value, and feed rates of the hazardous waste, and other fuels necessary to ensure compliance with §§ 266.34–4(b)(2) or 266.34(c)(2).

(2) For boiler and industrial furnaces that will be permitted without conducting a trial burn under the provision for low risk provided by § 266.34–4(a)(3) and which burn hazardous waste containing metals and chlorine at concentrations in conformance with the limits provided by §§ 266.34–4(b) (1) or (2) and 266.34–4(c) (1) or (2), the permit must:

(i) Incorporate the special operating requirements provided by § 266.34–4(a)(3)(i); and

(ii) Specify feed rate limits (lb/hr) for each Appendix VIII organic constituent in the hazardous waste consistent with the requirements of § 266.34–4(a)(3)(ii).

(3) For boilers and industrial furnaces that will be permitted based on a trial burn:

(i) For the period beginning with initial introduction of hazardous waste and ending with initiation of the trial burn, and only for the minimum time required to bring the device to a point of operational readiness to conduct a trial burn, not to exceed a duration of 720 hours operating time when burning hazardous waste the operating requirements must be those most likely to ensure compliance with the standards of § 266.34–4, based on the Regional Administrator's engineering judgment. The Regional Administrator may extend the duration of this period for up to 720 additional hours when good cause for the extension is demonstrated by the applicant.

(ii) For the duration of the trial burn, the operating requirements must be sufficient to demonstrate compliance with the standards of § 266.34–4 and must be in accordance with the approved trial burn plan;

(iii) For the period immediately following completion of the trial burn, and only for the minimum period sufficient to allow sample analysis, data computation, and submission of the trial burn results by the applicant, and review of the trial burn results and modification of the facility permit by the Regional Administrator to reflect the trial burn results, the operating requirements must be those most likely to ensure compliance with the standards of § 266.34–4, based on the Regional Administrator's engineering judgment.

(iv) For the remaining duration of the permit, the operating requirements must be those demonstrated in a trial burn or by alternative data specified in § 270.22 of this chapter, as sufficient to ensure compliance with the standards of § 266.34–4.

§ 266.34–6 Operating requirements.

(a) *General.* A boiler or industrial furnace burning hazardous waste must be operated in accordance with the operating requirements specified in the permit.

(b) *Specific requirements to ensure compliance with the organic emissions standards*—(1) *Carbon monoxide standard.* The permit must incorporate the stack gas carbon monoxide (CO) standard provided by § 266.34–4(a)(2).

(2) *DRE standard.* Operating conditions will be specified on a case-by-case basis for each hazardous waste burned as those demonstrated (in a trial burn or by alternative data as specified in § 270.22) to be sufficient to comply with the destruction and removal efficiency (DRE) performance standard of § 266.34–4(a)(1), except as provided by paragraph (b)(4) of this subsection. Each set of operating requirements will specify the composition of the hazardous waste (including acceptable variations in the physical or chemical properties of the hazardous waste which will not affect compliance with the DRE performance standard) to which the operating requirements apply. For each such hazardous waste, the permit will specify acceptable operating limits including the following conditions as appropriate:

(i) Hazardous waste feed rate;

(ii) Type and feed rate of other fuels with which the hazardous waste is cofired;

(iii) Type and feed rate of industrial furnace feedstocks when hazardous waste is burned;

(iv) Minimum boiler load or industrial furnace production rate;

(v) Appropriate controls on operation and maintenance of the hazardous waste firing system;

(vi) Allowable variation in boiler and industrial furnace system design or operating procedures; and

(vii) Such other operating requirements as are necessary to ensure that the DRE performance standard of § 266.34–4(a)(1) is met.

(3) *Start-up and shut-down.*

(i) A boiler or industrial furnace may not burn hazardous waste during start-up. Hazardous waste may be burned after the device has reached steady-state (normal) operations as evidenced by maintaining a time-weighted average carbon monoxide (CO) level in the flue gas not to exceed 100 ppm for an averaging period of not less than 10 minutes nor more than 60 minutes.

(ii) A boiler or industrial furnace may not burn hazardous waste during shut-down.

(4) For boilers that will be permitted without conducting a trial burn because they operate under the special operating requirements provided by § 266.34–4(a)(4) (that ensure compliance with the organic emission standard) and burn hazardous waste containing metals and chlorine at concentrations in conformance with the limits provided by §§ 266.34–4(b) (1), (2), or (3) and 266.34–4(c) (1), (2), or (3), the permit must include operating requirements that ensure conformance with each special operating requirement provided by § 266.34–4(a)(4) and the metals and chlorine limits of §§ 266.34–4(b) (1) or (2) and 266.34–4(c) (1) or (2).

(5) For boilers and industrial furnaces that will be permitted without conducting a trial burn under the provision for low risk waste provided by § 266.34–4(a)(3) and which burn hazardous waste containing metals and chlorine at concentrations in conformance with the limits provided by §§ 266.34–4(b) (1) or (2) and 266.34–4(c) (1) or (2), the permit must include operating requirements that ensure conformance with each special condition provided by § 266.34–4(a)(3)(i) and the metals and chlorine limits of §§ 266.34–4(b) (1) or (2) and 266.34–4(c) (1) or (2).

(c) *Specific operating requirements to ensure conformance with the metals standards provided by § 266.34–4(b).* (1)

For conformance with the Tier I metals specification standard provided by § 266.34-4(b)(1), the permit will specify the following operating requirements:

(i) Hazardous waste feed rate;

(ii) Metals levels in the hazardous waste; and

(iii) A hazardous waste sampling and metals analysis program.

(2) For conformance with the Tier II metals feed rate standard provided by § 266.34-4(b)(2), the permit will specify the following operating requirements:

(i) Hazardous waste feed rate;

(ii) Type and feed rate of other fuels and industrial furnace feedstocks with which the hazardous waste is burned;

(iii) Levels of metals in the hazardous waste, other fuels, and industrial furnace feedstocks; and

(iv) A sampling and metals analysis program for the hazardous waste, other fuels, and industrial furnace feedstocks.

(3) For conformance with the Tier III metals emission rates provided by § 266.34-4(b)(3), and the Tier IV metals ground level concentrations provided by § 266.34-4(b)(4), the permit will specify the following operating requirements:

(i) The requirements provided by paragraphs (c)(2)(i)-(iv) of this section;

(ii) Operation and maintenance of emissions control equipment sufficient to maintain removal efficiencies achieved during the trial burn; and

(iii) Such other operating requirements as are necessary to ensure that the metals standard is met.

(d) *Specific operating requirements to ensure conformance with the hydrogen chloride standards provided by § 266.34-4(c).* (1) For conformance with the Tier I chlorine specification standard provided by § 266.34.4(c)(1), the permit will specify the following requirements:

(i) Hazardous waste feed rate;

(ii) Total chlorine level in the hazardous waste; and

(iii) A hazardous waste sampling and chlorine analysis program.

(2) For conformance with the Tier II chlorine feed rate standard provided by § 266.34-4(c)(2), the permit will specify the following operating requirements:

(i) Hazardous waste feed rate;

(ii) Type and feed rate of other fuels and industrial furnace feedstocks with which the hazardous waste is burned;

(iii) Levels of chlorine in the hazardous waste, other fuels, and industrial furnace feedstocks; and

(iv) A sampling and chlorine analysis program for the hazardous waste, other fuels, and industrial furnace feedstocks.

(3) For conformance with the Tier III hydrogen chloride (HCl) emissions rates provided by § 266.34-4(b)(3), and the Tier IV HCl ground level concentrations provided by § 266.34-4(c)(4), the permit will specify the following operating requirements:

(i) The requirements provided by paragraphs (d)(2)(i)-(iv) of this section;

(ii) Operation and maintenance of emissions control equipment sufficient to maintain removal efficiencies achieved during the trial burn; and

(iii) Such other operating requirements as are necessary to ensure that the HCl standards are met; and

(e) *General requirements*—(1) *Fugitive emissions.* Fugitive emissions from the combustion zone when burning hazardous waste must be controlled by:

(i) Keeping the combustion zone totally sealed against fugitive emissions;

(ii) Maintaining a combustion zone pressure lower than atmospheric pressure; or

(iii) An alternate means of control demonstrated (with Part B of the permit application) to provide fugitive emissions control equivalent to maintenance of combustion zone pressure lower than atmospheric pressure.

(2) *Automatic cutoff.* A boiler or industrial furnace must be operated with a functioning system that automatically cuts off the hazardous waste feed when operating conditions deviate from those established under this subsection.

(3) *Changes.* A boiler or industrial furnace must cease burning hazardous waste when changes in composition, properties, or feed rates of the hazardous waste, other fuels, or industrial furnace feedstocks, or changes in the boiler or industrial furnace design or operating conditions exceed the limits designated in its permit.

§ 266.34-7 Monitoring and inspections.

(a) The owner or operator must monitor and record the following, as a minimum, while burning hazardous waste:

(1) Hazardous waste feed rate, and, if required by the permit, the feed rate of other fuels and industrial furnace feedstocks.

(2) Carbon monoxide (CO) and oxygen on a continuous basis at a common point in the boiler or industrial furnace downstream of the combustion zone and prior to release of stack gases to the atmosphere. CO and oxygen monitors must be installed, operated, and maintained in accordance with *Guideline for Continuous Monitoring of Carbon Monoxide at Hazardous Waste Incinerators, Appendix D,* PES, January 1987.

(3) Upon the request of the Regional Administrator, sampling and analysis of the hazardous waste (and other fuels and industrial furnace feedstocks as appropriate) and exhaust emissions must be conducted to verify that the operating requirements established in the permit achieve the standards of § 266.34-4.

(b) The boiler or industrial furnace and associated equipment (pumps, valves, pipes, fuel storage tanks when they contain hazardous waste, etc.) must be subjected to thorough visual inspection, at least daily when hazardous waste is burned, for leaks, spills, fugitive emissions, and signs of tampering.

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

(d) These monitoring and inspection data must be recorded and the records must be placed in the operating log required by § 264.73 of this chapter.

§ 266.34-8 Closure.

At closure, the owner or operator must remove all hazardous waste and hazardous waste residues (including, but not limited to, ash, scrubber waters, and scrubber sludges) from the boiler or industrial furnace site.

§ 266.35 Interim status standards for owners and operators of facilities that burn hazardous waste in a boiler or industrial furnace.

§ 266.35-1 Applicability.

(a) *General.* The purpose of this section is to establish minimum national standards for owners and operators of facilities that burn hazardous waste in boilers or industrial furnaces where such standards define the acceptable management of hazardous waste during the period of interim status and until certification of final closure. The standards of this section apply to owners and operators of facilities that are in existence on the effective date of this section until either a permit is issued under § 266.34 or until the closure responsibilities identified in this section are fulfilled.

Note.—A boiler or industrial furnace is "in existence" if it was burning hazardous waste or was under construction that would enable it to burn hazardous waste on or before the effective date of § 266.35. A facility has commenced construction if it meets the conditions provided by paragraphs (1) and (2) of the definition of "Existing hazardous waste management (HWM) facility" in § 260.10 of this chapter. If the boiler or industrial furnace is located at a facility that already has a permit or interim status, then the facility must comply with the applicable regulations dealing with modifications in §§ 270.41 and 42 of this chapter.

(b) *Exemptions.* The requirements of this section do not apply to:

(1) Hazardous waste exempt under § 266.30(b); and

(2) *Small quantity on-site burners.* Owners and operators of facilities that burn hazardous waste that they generate in an on-site boiler and industrial furnace are exempt from the requirements of this section provided that they meet the requirements of § 266.34–1(b).

(c) *Prohibition on burning dioxin-containing wastes.* Hazardous waste containing or derived from any of the following dioxin-containing waste may not be burned in a boiler or industrial furnace operating under the interim status standards of this section: EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027.

(d) *Applicability of Part 265 standards.* Owners and operators of boilers and industrial furnaces that burn hazardous waste are subject to the following provisions of Part 265 of this chapter, except as provided otherwise by this subsection:

(1) In Subpart A (General), § 265.4:

(2) In Subpart B (General facility standards), §§ 265.11–265.17;

(3) In Subpart C (Preparedness and prevention), §§ 265.31–265.37;

(4) In Subpart D (Contingency plan and emergency procedures), §§ 265.51–265.56;

(5) In Subpart E (Manifest system, recordkeeping, and reporting), §§ 265.71–265.77, except that §§ 265.71, 265.72, and 265.76 do not apply to owners and operators of on-site facilities that do not receive any hazardous waste from off-site sources;

(6) In Subpart G (Closure and post-closure), §§ 265.111–265.115; and

(7) In Subpart H (Financial requirements), §§ 265.141, 265.143, and 265.147–265.151, except that States and the Federal government are exempt from the requirements of Subpart H.

§ 266.35-2 Hazardous waste analysis.

(a) In addition to the waste analyses required by § 265.13 of this chapter, the owner or operator must sufficiently analyze any hazardous waste that he has not previously burned in his boiler or industrial furnace to enable him to establish steady-state (normal) operating conditions and to comply with the stack gas carbon monoxide standard and metals and hydrogen chloride standards provided by § 266.35–3.

(b) The owner or operator must sufficiently analyze the hazardous waste that he burns to determine the type of pollutants that might be emitted. At a minimum, the analysis must determine:

(1) Heating value of the hazardous waste, as fired;

(2) Concentrations in the hazardous waste itself, or, as fired after blending with other waste or fuel, of arsenic, cadmium, chromium, and lead, unless the owner or operator has written, documented data that show that the metal is not present; and

(3) Chlorine content of the hazardous waste itself, or, as fired.

Note.—As required by § 265.73 of this chapter, the owner or operator must place the results from each waste analysis, or the documented information in the operating record of the facility.

§ 266.35-3 Operating requirements.

(a) A boiler or industrial furnace burning hazardous wastes under this subsection shall meet and demonstrate compliance with the metals and hydrogen chloride standards provided in § 266.34–4 (b) and (c).

(b) *Carbon monoxide standard.* (1) Except as provided by paragraph (b)(2) of this subjection, a boiler or industrial furnace burning hazardous waste must be operated in conformance with the carbon monoxide (CO) standards provided by § 266.34–4(a)(2).

(2) Owners and operators who submit a Part B application six months prior to the effective date of the carbon monoxide monitoring requirement of this paragraph and who claim to demonstrate that the hazardous waste is a low risk waste under provisions of § 266.34–4(a)(3) (and not subject to CO monitoring or the DRE performance standard) are not subject to the CO monitoring requirements of this paragraph.

(b) *Start-up and shut-down.* (1) A boiler or industrial furnace may not burn hazardous waste during start-up. Hazardous waste may be burned after the device has reached steady-state (normal) operations as evidenced by maintaining a time-weighted average carbon monoxide (CO) level in the flue gas not to exceed 100 ppm for an averaging period of not less than 10 minutes nor more than 60 minutes.

(2) A boiler or industrial furnace may not burn hazardous waste during shut-down.

§ 266.35-4 Monitoring and inspections.

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

(1) Except as provided by § 266.35–3(b)(2), carbon monoxide (CO) and oxygen must be monitored on a continuous basis at a common point in the boiler or industrial furnace downstream of the combustion zone and prior to release of stack gases to the atmosphere. CO and oxygen monitors must be installed, operated, and maintained in accordance with: *Guideline for Continuous Monitoring of Carbon Monoxide at Hazardous Waste Incinerators. Appendix D. PES,* January 1987.

(2) Other existing instruments that relate to combustion and emission control must be monitored at least every 15 minutes. Appropriate corrections to maintain steady state combustion conditions and normal emission control operations must be made immediately either automatically or by the operator. Instruments that relate to combustion and emission control would normally include those measuring hazardous waste feed rates, feed rate of other fuels, feed rate of industrial furnace feedstocks, hazardous waste firing system pressure, scrubber flow and scrubber water pH, electrostatic precipitator spark rate, and fabric filter pressure drop.

(b) The boiler or industrial furnace and associated equipment (pumps, valves, pipes, etc.) must be subjected to thorough visual inspection, at least daily when hazardous waste is burned, for leaks, spills, fugitive emissions, and signs of tampering.

(c) The emergency hazardous waste feed cutoff system and associated alarms must be tested at least weekly when hazardous waste is burned to verify operability, unless the owner or operator has written documentation that weekly inspections will unduly restrict or upset operations and that less frequent inspections will be adequate. At a minimum, operational testing must be conducted at least monthly.

§ 266.35-5 Closure.

At closure, the owner or operator must remove all hazardous waste and hazardous waste residues (including, but not limited to, ash, scrubber water, and scrubber sludges) from the boiler or industrial furnace site.

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

VI. In Part 270:

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

Authority: Secs. 1006, 2002, 3005, 3007, and 7004 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended by the Hazardous and Solid Waste Amendments of 1984 (42 U.S.C. 6905, 6912, 6925, 6927, and 6974).

2. It is proposed to amend paragraph (a) of § 270.6 by adding the following:

§ 270.6 References

(a) * * *

"Guideline on Air Quality Models (Revised)", July 1986, 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.

"Guidelines for Permit Writers: Permitting Hazardous Waste Combustion Facilities Using Risk Assessment".

3. It is proposed to add § 270.22 to Subpart B to read as follows:

§ 270.22 Specific Part B information requirements for boilers and industrial furnaces burning hazardous waste.

(a) Except as provided otherwise by § 266.30(d) (exemption of certain hazardous waste) and § 266.34-1(b) (exemption of small quantity on-site burners) of this chapter, owners and operators of boilers and industrial furnaces that burn hazardous waste must conduct a trial burn in accordance with § 270.65 to demonstrate conformance with the standards in § 266.34-4 of this chapter, unless a trial burn is not required under provisions of that section and the owner or operator demonstrates compliance with those provisions as provided by paragraph (c) of this section.

(b) Owners and operators not seeking to be permitted under provisions that do not require a trial burn must submit a trial burn plan or the results of a trial burn, including all required determinations, in accordance with § 270.65.

(c) Owners and operators seeking to be permitted under provisions of § 266.34-4 of this chapter that do not require a trial burn must submit documentation as follows:

(1) *Boilers operated under special operating requirements for conformance with the organic emissions standard.* When seeking to be permitted under § 266.34-4(a)(4) of this chapter, the owner or operator of a boiler must submit documentation that the boiler operates under the special operating requirements provided by that paragraph;

(2) *Boilers and industrial furnaces burning low risk waste.* When seeking to be permitted under the provisions for low risk waste provided by § 266.34-4(a)(3) of this chapter so that neither the trial burn nor carbon monoxide (CO) monitoring are required, the owner or operator of a boiler or industrial furnace must submit:

(i) Documentation that the device is operated in conformance with the requirements of § 266.34-4(a)(3)(i) of this chapter.

(ii) Results of analyses documenting the concentration of organic compounds listed in Appendix VIII of Part 261 of this chapter that could reasonably be expected to be constituents of each hazardous waste to be burned.

(iii) Documentation of hazardous waste firing rates and calculations of reasonable, worst-case emission rates of each constituent identified in paragraph (c)(3)(ii) of this section assuming the device achieves a 99% destruction efficiency for each constituent as provided by § 266.34-4(a)(3)(ii)(B) of this chapter.

(iv) Calculations of reasonable, worst-case emission rates of products of incomplete combustion (PICs) for each constituent identified in paragraph (c)(3)(ii) of this section using procedures established in "Guidelines for Permit Writers: Permitting Hazardous Waste Combustion Facilities Using Risk Assessment" (incorporated by reference, see § 270.6). This document is herein termed the Risk Assessment Guideline or RAG.

(v) Results of emissions modeling for emissions identified in paragraphs (c)(2)(iii) and (iv) of this section using modeling Procedures provided by "Guideline on Air Quality Models (Revised)" (incorporated by reference, see § 270.6). This document is herein termed the GAQM. The Director will review the emission modeling conducted by the applicant to determine conformance with the GAQM. The Director will either approve the modeling or determine that alternate or supplementary modeling is appropriate.

(vi) For each noncarcinogenic constituent identified in paragraph (c)(2)(ii) of this section, provide documentation that emissions will not result in exceedances of the reference air concentrations (RACs) identified in the RAG.

(vii) For each carcinogenic constituent identified in paragraph (c)(2)(ii) of this section and for products of incomplete combustion (PICs) quantified in conformance with paragraph (c)(2)(iii) of this section, results of the computation required by § 266.34-4(a)(3)(ii)(E) of this chapter.

(3) *Boilers and industrial furnaces meeting the Tier I or Tier II metals controls.* When seeking to be permitted under the provisions of § 266.34-4(b)(1) (Tier I) or § 266.34-4(b)(2) (Tier II) that control metals emissions without requiring a trial burn, the owner or operator of a boiler or industrial furnace must submit:

(i) For conformance with the Tier I metal specification provided by § 266.34-4(b)(1) of this chapter:

(A) Documentation of the hazardous waste feed rate;

(B) Documentation of metals levels in the hazardous waste;

(C) Documentation of the heat input capacity (MM Btu/hr) of the device: and

(D) Proposed hazardous waste sampling and metals analysis plan.

(ii) For conformance with the Tier II metals feed rate standard provided by § 266.34-4(b)(2) of this chapter:

(A) Documentation of the hazardous waste feed rate;

(B) Documentation of the type and feed rate of other fuels and industrial furnace feedstocks with which the hazardous waste is burned;

(C) Documentation of the levels of metals in the hazardous waste, other fuels, and industrial furnace feedstocks;

(D) Documentation of the heat input capacity (MM Btu/hr) of the device; and

(E) Proposed sampling and metals analysis plan for the hazardous waste, other fuels, and industrial furnace feedstocks.

(4) *Boilers and industrial furnaces meeting the Tier I or Tier II HCl control.* When seeking to be permitted under the provision of § 266.34-4(c)(1) (Tier I) or § 266.34-4(c)(2) (Tier II) that control hydrogen chloride (HCl) emissions without requiring a trial burn, the owner or operator of a boiler or industrial furnace must submit:

(i) For conformance with the Tier I chlorine specification provided by § 266.34-4(c)(1) of this chapter:

(A) Documentation of the hazardous waste feed rate;

(B) Documentation of the chlorine level in the hazardous waste;

(C) Documentation of the heat input capacity (MM Btu/hr) of the device; and

(D) Proposed hazardous waste sampling and chlorine analysis plan.

(ii) For conformance with the Tier II chlorine feed rate standard provided by § 266.34-4(c)(2) of this chapter:

(A) Documentation of the hazardous waste feed rate;

(B) Documentation of the type and feed rate of other fuels and industrial furnace feedstocks with which the hazardous waste is burned;

(C) Documentation of the levels of chlorine in the hazardous waste, other fuels, and industrial furnace feedstocks;

(D) Documentation of the heat input capacity (MM Btu/hr) of the device; and

(E) Proposed sampling and chlorine analysis plan for the hazardous waste, other fuels, and industrial furnace feedstocks.

(5) *Data in lieu of a trial burn.* The owner or operator of a boiler or industrial furnace may seek an exemption from the trial burn by providing information from trial or operational burns of similar boilers or industrial furnaces burning similar hazardous wastes under similar conditions. The Director shall approve a permit application without a trial burn if he finds that the hazardous wastes are sufficiently similar, the devices are sufficiently similar, and the data from other trial burns are adequate to specify (under § 266.34-6 of this chapter) operating conditions that will ensure conformance with the standards in § 266.34-4 of this chapter. In seeking this exemption, the applicant must submit the following information:

(i) An analysis of each hazardous waste to be burned including:

(A) Heating value, levels of arsenic, cadmium, chromium, lead, and chlorine and the composition of the hazardous waste, as fired (after blending);

(B) Viscosity and maximum particle size (if applicable), or a description of the physical form of the hazardous waste;

(C) An identification of any hazardous organic and inorganic constituents listed in Part 261, Appendix VIII, of this chapter, which are present in the hazardous waste, except that the applicant need not analyze for constituents listed in Appendix VIII which would reasonably not be expected to be found in the hazardous waste. The constituents excluded from analysis must be identified and the basis for their exclusion explained. The analysis must rely on analytical techniques specified in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 270.6 and referenced in 40 CFR Part 261, Appendix III, or their equivalent);

(D) An appropriate quantification of the hazardous constituents identified in the hazardous waste, within the precision produced by the analytical methods specified in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 270.6); and

(E) A quantification of those hazardous constituents in the hazardous waste that may be designated as POHCs based on data submitted from other trial or operational burns which demonstrate compliance with the performance standards in § 266.34 4 of this chapter;

(ii) A detailed engineering description of the boiler or industrial furnace, including:

(A) Manufacturer's name and model number of boiler or industrial furnace;

(B) Type of boiler or industrial furnace;

(C) Description of feed system for hazardous waste, other fuel, and industrial furnace feedstocks;

(D) Capacity of hazardous waste feed system;

(E) Description of automatic hazardous waste feed cutoff system(s);

(F) Description of any emission control system(s); and

(G) Description of stack gas monitoring and any pollution control monitoring systems;

(iii) A description and analysis of the hazardous waste to be burned compared with the hazardous waste for which data from operational or trial burns are provided to support the contention that a trial burn is not needed. The data should include those items listed in paragraph (c)(5)(i) of this section. This analysis should specify the POHCs that the applicant has identified in the hazardous waste for which a permit is sought, and any differences from the POHCs in the hazardous waste for which burn data are provided;

(iv) The design and operating conditions of the boiler or industrial furnace to be used, compared with that for which comparative burn data are available, including:

(A) Feed rate of the hazardous waste;

(B) The type, feed rate, and heating value of other fuels fired when hazardous waste is burned, and, if the levels of arsenic, cadmium, chromium, lead, or chlorine in the hazardous waste exceed the specification levels provided by §§ 266.34-6(c)(3) and 266.39-6(d)(3) of this chapter, the levels of those constituents in the other fuels; and

(C) The type and feed rate of industrial furnace feedstocks, and, if the levels of arsenic, cadmium, chromium, lead, or chlorine in the hazardous waste exceed the specification levels provided by §§ 266.34-6(c)(3) and 266.34-6(d)(3) of this chapter, the levels of those constituents in the feedstocks;

(v) A description of the results submitted from any previously conducted trial burn(s) including:

(A) Sampling and analysis techniques used to calculate conformance with performance standards in § 266.34-4 of this chapter; and

(B) Methods and results of monitoring feed rates of hazardous waste and, as appropriate, other fuels and industrial furnace feedstocks;

(vi) The expected boiler or industrial furnace operation information to demonstrate compliance with §§ 266.34-4 and 266.34-6 of this chapter, including:

(A) Hazardous waste feed rate, and, as appropriate, feed rate of other fuels and industrial furnace feedstocks;

(B) Expected removal efficiency for arsenic, cadmium, chromium, lead, and hydrogen chloride;

(C) Expected fugitive emissions and their control procedures; and

(D) Proposed allowable hazardous waste feed variations including feed rate, composition, metals, and chlorine levels;

(vi) Such supplemental information as the Director finds necessary to achieve the purposes of this paragraph.

(vii) Hazardous waste analysis data, including that submitted in paragraph (c)(5)(i) of this section, sufficient to allow the Director to specify in the permit the Principle Organic Hazardous Constituents (permit POHCs) for which destruction and removal efficiencies will be required.

(d) Owners and operators seeking to be permitted under Tiers I, II, or III for metals and chlorine under the provisions of § 266.34-4(b)(1)-(3) and § 266.34-4(c)(1)-(3) of this chapter must submit the documentation needed to determine whether the permitted device is sited in complex or flat terrain as defined in the aforementioned provisions. The applicant must give the methodology for the determination including such information as the stack height and topographical data including maps used in making the determination.

(e) Owners and operators seeking to be permitted under the Tier IV metals provision of § 266.34-4(b)(4) of this chapter must submit a dispersion modeling plan with Part B of the permit application. The Director will review the plan for conformance with the "Guideline for Air Quality Monitoring" (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 emission rates, the owner or operator must conduct dispersion modeling according to the approved plan and submit the results to the Director. The Director will determine whether the results are in conformance with the requirements of § 266.34-4(b)(4) of this chapter and will establish appropriate operating requirements as required by § 266.34-4(c)(3) of this chapter.

(f) Owners and operators seeking to be permitted under the Tier IV hydrogen chloride (HCl) provisions of § 266.34-

4(c)(4) of this chapter must submit a dispersion modeling plan with Part B of the permit application. The Director will review the plan for conformance with the "Guideline for Air Quality Monitoring (Revised)" (incorporated by reference, see § 270.6). The Director will either approve the modeling plan or determine that an alternative or supplementary plan is appropriate. After completion of the trial burn to measure HCl emission rates, the owner or operator must conduct dispersion modeling according to the approved plan and submit the results to the Director. The Director will determine whether the results are in conformance with the requirements of § 266.34-4(c)(4) of this chapter and will establish appropriate operating requirements as required by § 266.34-6(d)(3) of this chapter.

Subpart F—Special Forms of Permits

4. It is proposed to add § 270.66 to Subpart F to read as follows:

§ 270.66 Permits for boilers and industrial furnaces burning hazardous waste.

(a) *General.* New boilers (those boilers not operating under the interim status standards of § 266.35 of this chapter) are subject to paragraph (b) of this section if they will be permitted without a trial burn under § 266.34.5-(d)(1) of this chapter. New boilers and industrial furnaces that will be permitted based on a trial burn under § 266.34-5(d)(3) of this chapter are subject to paragraph (c) of this section. Boilers and industrial furnaces operating under the interim status standards of § 266.35 of this chapter are subject to paragraph (d) of this section.

Note.—New boilers and industrial furnaces permitted without a trial burn under the provision for low risk waste provided by § 266.34-4(a)(3) of this chapter are not subject to the special permits of this section if a trial burn is not required to demonstrate compliance with the Tier III or Tier IV metals or HCl controls. Such facilities are awarded an operating permit after the Director establishes that the facility is in conformance with § 266.34-4(a)(3) of this chapter and the Tier I or Tier II metals and HCl controls.

(b) *New boilers permitted without a trial burn.* New boilers that will be permitted without a trial burn under § 266.34-5(d)(1) of this chapter are subject to the operating requirements in §§ 266.34-6(b)(4) (to control organic emissions), 266.34-6(c) (2) or (3) (to control metals emissions), and 266.34-6(d) (2) or (3) (to control HCl emissions) of this chapter. These requirements are termed "Special Operating Requirements." New boilers that operate under the Special Operating Requirements are subject to the following permits:

(1) *Predemonstration period.* The predemonstration period begins with initial introduction of hazardous waste to the boiler and extends for the minimum time required, not to exceed a duration of 720 hours operating time when burning hazardous waste, to bring the boiler to a point of operation readiness to conduct a demonstration that the boiler can operate under the Standing Operating Requirements. During this period, the boiler must be operated in conformance with the Standard Operating Requirements. The Regional Administrator may extend the duration of this period once for up to 720 additional hours when good cause for the extension is demonstrated by the applicant. The permit may be modified to reflect the extension according to § 270.42 (minor modifications of permits).

(i) Applicants must submit a statement with Part B of the permit application demonstrating how they will comply with the Standard Operating Requirements. If the hazardous waste is off-specification for metals or chlorine, the statement should include limitations, as appropriate, on the metals and chlorine content, heating value, and feed rates of the hazardous waste, other fuel, and industrial furnace feedstocks to demonstrate conformance with §§ 266.34-6(c)(2) and 266.34-6(d)(2) of this chapter.

(ii) The Director will review this statement and any other relevant information submitted with Part B of the permit application and determine whether the applicant is likely to be able to comply with the Standard Operating Requirements.

(2) *Demonstration period.* For the period immediately after completion of the first period of operation and only for the minimum period sufficient to allow sample analysis, data computation, and submission of the results by the applicant demonstrating conformance with the Standard Operating Requirements, the boiler is subject to the Standard Operating Requirements. During this period, the applicant is operating under a Demonstration Permit. The Demonstration Permit is an extension of the Predemonstration Permit and constitutes a minor modification of permits under § 270.42.

(3) *Post-demonstration period.* After successful completion of the demonstration period, the boiler operates under a Final Permit in conformance with the Standard Operating Requirements. If the hazardous waste is off-specification for metals or chlorine, the Director will specify changes to limitations, as appropriate, on the metals and chlorine content, heating value, and feed rates of the hazardous waste, other fuels, and industrial furnace feedstocks and requirements for the operation and maintenance of emissions control equipment necessary to ensure compliance with §§ 266.34-6(c)(2) or 266.34-6(d)(2) of this chapter. The Final Permit is an extension of, and modification to, as necessary, the Demonstration Permit and constitutes a minor modification of permits under § 270.42.

(c) *New boilers and industrial furnaces permitted with a trial burn.* New boilers and industrial furnaces that will be permitted with a trial burn under § 266.34-5(d)(2) of this chapter are subject to the following permits:

(1) *Pretrial burn period.* For the period beginning with initial introduction of hazardous waste and ending with initiation of the trial burn, and only for the minimum time required to bring the boiler or industrial furnace to a point of operation readiness to conduct a trial burn, not to exceed 720 hours operating time when burning hazardous waste, the Director must establish in a Pretrial Burn Permit conditions, including but not limited to, allowable hazardous waste feed rates and operating conditions. The Director may extend the duration of this operational period once, for up to 720 additional hours, at the request of the applicant when good cause is shown. The permit may be modified to reflect the extension according to § 270.42 (minor modifications of permits).

(i) Applicants must submit a statement, with Part B of the permit application, that suggests the conditions necessary to operate in compliance with the standards of § 266.34-4 of this chapter during this period. This statement should include, at a minimum, restrictions on hazardous waste constituents including arsenic, cadmium, chromium, lead, and chlorine, hazardous waste heating value and feed rates, and the operating parameters identified in § 266.34-6 of this chapter.

(ii) The Director will review this statement and any other relevant information submitted with Part B of the permit application and specify requirements for this period sufficient to meet the performance standards of § 266.34-4 of this chapter based on his engineering judgment.

(2) *Trial burn period.* For the duration of the trial burn, the Director must establish conditions in the permit for the purposes of determining feasibility of compliance with the performance

standards of § 266.34-4 of this chapter and of determining adequate operating conditions under § 266.34-6 of this chapter.

(i) Applicants must propose a trial burn plan, prepared under paragraph (c)(2)(ii) of this section, to be submitted with Part B of the permit application.

(ii) The trial burn plan must include the following information:

(A) An analysis of each hazardous waste, as fired, that includes:

(*1*) Heating value, levels of arsenic, cadmium, chromium, lead, and chlorine, and composition of the hazardous waste;

(*2*) Viscosity and maximum particle size (if applicable), or description of the physical form of the hazardous waste;

(*3*) An identification of any hazardous organic constituents listed in Part 261, Appendix VIII of this chapter that are present in the hazardous waste, except that the applicant need not analyze for constituents listed in Appendix VIII that would reasonably not be expected to be found in the hazardous waste. The constituents excluded from analysis must be identified and the basis for their exclusion explained. The analysis must rely on analytical techniques specified in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 270.6), or their equivalent.

(*4*) An approximate quantification of the hazardous constituents identified in the hazardous waste, within the precision produced by the analytical methods specified in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 270.6), or other equivalent.

(*5*) A description of blending procedures, if applicable, prior to firing the hazardous waste, including a detailed analysis of the hazardous waste prior to blending, an analysis of arsenic, cadmium, chromium, lead, and chlorine levels in the fuel with which the hazardous waste is blended, and blending ratios.

(B) A detailed engineering description of the boiler or industrial furnace, including:

(*1*) Manufacturer's name and model number of the boiler or industrial furnace;

(*2*) Type of boiler or industrial furnace;

(*3*) Maximum rated heat input;

(*4*) Description of the feed system for the hazardous waste, and, as appropriate, other fuels and industrial furnace feedstocks;

(*5*) Capacity of hazardous waste feed system:

(*6*) Description of automatic hazardous waste feed cutoff system(s):

(*7*) Description of any emission control system(s); and

(*8*) Description of stack gas monitoring and any pollution control monitoring systems.

(C) A detailed description of sampling and monitoring procedures including sampling and monitoring locations in the system, the equipment to be used, sampling and monitoring frequency, and planned analytical procedures for sample analysis.

(D) A detailed test schedule for each hazardous waste for which the trial burn is planned, including date(s), duration, quantity of hazardous waste to be burned, and other factors relevant to the Director's decision under paragraph (c)(2)(v) of this section.

(E) A detailed test protocol, including, for each hazardous waste identified, the ranges of hazardous waste feed rate, and, as appropriate, the feed rates of other fuels and industrial furnace feedstocks, and any other relevant parameters that will be varied and that may affect the ability of the boiler or industrial furnace to meet the performance standards in § 266.34-4 of this chapter.

(F) A description of, and planned operating conditions for, any emission control equipment that will be used.

(G) Procedures for rapidly stopping the hazardous waste feed and controlling emissions in the event of an equipment malfunction.

(H) Such other information as the Director reasonably finds necessary to determine whether to approve the trial burn plan in light of the purposes of this paragraph and the criteria in paragraph (c)(2)(v) of this section.

(iii) The Director, in reviewing the trial burn plan, shall evaluate the sufficiency of the information provided and may require the applicant to supplement this information, if necessary, to achieve the purposes of this paragraph.

(iv) Based on the hazardous 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. These trial POHCs will be specified by the Director based on his estimate of the difficulty of destroying the constituents identified in the hazardous waste analysis, their concentration or mass in the hazardous waste feed, and, for hazardous waste containing or derived from wastes listed in Part 261, Subpart D of this chapter, the hazardous waste organic constituent(s) identified in Appendix VII of that part as the basis for listing.

(v) The Director shall approve a trial burn plan if he finds that:

(A) The trial burn is likely to determine whether the boiler or industrial furnace can meet the performance standards in § 266.34-4 of this chapter;

(B) The trial burn itself will not present an imminent hazard to human health and the environment:

(C) The trial burn will help the Director to determine operating requirements to be specified under § 266.34-6 of this chapter; and

(D) The information sought in paragraphs (c)(2)(v) (A) and (C) of this section cannot reasonably be developed though other means.

(vi) The Director shall extend and modify the Pretrial Burn Permit as necessary to accommodate the approved trial burn plan. The permit modification shall proceed as a minor modification according to § 270.42.

(vii) During each approved trial burn (or as soon after the burn as is practicable), the applicant must make the following determinations:

(A) A quantitative analysis of the trial POHCs and of arsenic, cadmium, chromium, lead, and chlorine, in the hazardous waste feed to the boiler or incinerator:

(B) A quantitative analysis of the exhaust gas for the concentration and mass emissions of the trial POHCs:

(C) If the hazardous waste is off-specification for arsenic, cadmium, chromium, lead, or chlorine, for each element for which the hazardous waste is off-specification:

(*1*) A quantitative analysis of levels of the element(s) in other fuels and industrial furnace feedstocks, the heating value of the hazardous waste and other fuels, and the feed rates of the hazardous waste, other fuels, and industrial furnace feedstocks to demonstrate conformance with the computed allowable concentrations of metals and chlorine provided in §§ 266.34-6 (c)(2) and (d)(2) of this chapter; or

(*2*) A quantitative analysis of the exhaust gas for the concentration and mass emission of the metal(s) or hydrogen chloride (HCl), and a computation showing conformance with the metals or HCl emission performance standard in § 266.34-4 (c) and (d) of this chapter;

(E) 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, the fate of any metal subject to emissions testing under paragraph (c)(vi)(C)(*2*) of this section, and the fate of chlorine if subject to emission testing under paragraph (c)(vi)(D)(*2*) of this section;

(F) A computation of destruction and removal efficiency (DRE), in accordance with the DRE formula specified in § 266.34-4(a)(1) of this chapter;

(G) An identification of sources of fugitive emissions and their means of control;

(H) A continuous measurement of carbon monoxide (CO) and oxygen in the exhaust gas; and

(1) Such other information as the Director may specify as necessary to ensure that the trial burn will determine compliance with the performance standards in § 266.34-4 of this chapter and to establish the operating conditions required by § 266.34-6 of this chapter as necessary to meet those performance standards.

(viii) The applicant must submit to the Director a certification that the trial burn has been carried out in accordance with the approved trial burn plan, and must submit the results of all the determinations required in paragraph (c)(2)(vi) of this section. This submission shall be made within 90 days of completion of the trial burn, or later if approved by the Director.

(ix) All data collected during any trial burn must be submitted to the Director following completion of the trial burn.

(x) All submissions required by this paragraph must be certified on behalf of the applicant by the signature of a person authorized to sign a permit application or a report under § 270.11.

(xi) Based on the results of the trial burn, the Director shall set the operating requirements in the Final Permit according to § 266.34-6 of this chapter. The permit modification shall proceed as a minor modification according to § 270.42.

(3) *Post-trial burn period.* For the period immediately following completion of the trial burn, and only for the minimum period sufficient to allow sample analysis, data computation, and submission of the trial burn results by the applicant, and review of the trial burn results and modification of the facility permit by the Director to reflect the trial burn results, the Director will establish the operating requirements most likely to ensure compliance with the performance standards of § 266.34-4 of this chapter based on his engineering judgment. The Director shall so extend and modify the Trial Burn Permit to develop the Post-Trial Burn Permit. The permit modification shall proceed as a minor modification according to § 270.42.

(i) Applicants must submit a statement, with Part B of the permit application, that identifies the conditions necessary to operate in compliance with the performance standards of § 266.34-4 of this chapter, during this period. This statement should include, at a minimum, restrictions on hazardous waste constituents, including arsenic, cadmium, chromium, lead, and chlorine, hazardous waste feed rates, and the operating parameters identified in § 266.34-6 of this chapter.

(ii) The Director will review this statement and any other relevant information submitted with Part B of the permit application and specify requirements for this period sufficient to meet the performance standards of § 266.34-4 of this chapter based on his engineering judgment.

(4) *Final permit.* After review of the trial burn results, the Director will modify the permit as necessary to develop the Final Permit that will ensure compliance with the performance standards of § 266.34-4 of this chapter. The permit modification shall proceed as a minor modification according to § 270.42.

(d) *Interim status boilers and industrial furnaces*—(1) *Existing boilers to be permitted without a trial burn.* Applicants owning or operating existing boilers operated under the interim status standards of § 266.35 of this chapter and that will be permitted without conducting a trial burn because they operate under the Standard Operating Requirements in §§ 266.34-6(b)(4), 266.34-6(c) (2) or (3), and 266.34-6(d) (2) or (3) of this chapter must submit with Part B of the permit application documentation that the boiler is operated in accordance with the Standard Operating Requirements. The statement must include, at a minimum, the operating record documenting continuous measurement of carbon monoxide (CO) and oxygen in the exhaust gas. If the hazardous waste is off-specification for metals or chlorine, the statement must also include limitations, as appropriate, on the metals and chlorine content, heating value, and feed rates of the hazardous waste, other fuel, and industrial furnace feedstocks to demonstrate conformance with §§ 266.34-6(c)(2) and 266.34-6(d)(2) of this chapter.

(2) *Existing industrial furnaces and boilers that will be permitted with a trial burn.* Applicants owning or operating existing boilers or industrial furnaces operated under the interim status standards of § 266.35 of this chapter and that will be permitted with a trial burn for the purposes of determining compliance with the performance standards of § 266.34-4 of this chapter and of determining adequate operating conditions under § 266.34-6 of this chapter, must prepare and submit a trial burn plan and perform a trial burn in accordance with paragraphs (c)(2)(ii) through (c)(2)(ix) of this section. Applicants who submit a trial burn plan and receive approval before submission of the Part B permit application must complete the trial burn and submit the results specified in paragraph (c)(2)(vi) of this section with the Part B permit application. If completion of this process conflicts with the date set for submission of the Part B application, the applicant must contact the Director to establish a later date for submission of the Part B application or the trial burn results. If the applicant submits a trial burn plan with Part B of the permit application, the trial burn must be conducted and the results submitted within a time period to be specified by the Director.

PART 271—REQUIREMENTS FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

VII. In Part 271:

1. The authority citation for Part 271 continues to read as follows:

Authority: Secs. 1006, 2002(a), and 3006 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912(a), and 692.6).

§ 271.1 [Amended]

2. It is proposed to amend § 271.1(j) by adding the following entry to Table 1 in chronological order by date of publication:

TABLE 1.—REGULATIONS IMPLEMENTING THE HAZARDOUS AND SOLID WASTE AMENDMENTS OF 1984

Date of publication in the FEDERAL REGISTER	Title of regulation
* *	* * *
[Insert promulgation date].	Standards for Owners and Operators of Boilers and Industrial Furnaces.
* *	* * *

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