INDEN 5350

CREATIVE COMPONENT

THERMAL TREATMENT OF HAZARDOUS WASTE IN BOILERS AND INDUSTRIAL FURNACES

SUBMITTED TO

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BY

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CONTENTS

ABSTRACT

The paper describes the various aspects of the new regulation that governs burning hazardous waste in boilers and industrial furnaces. The new regulation is effective from August 21, 1991, thus it is vital that any industry that might be affected by this rule take action immediately. An effort has been made to highlight some important features of the rules such as exemptions and waivers. A guide book has been provided for the following situations

1) A new facility or an existing facility attempting to use the small quantity burner exemption.

2) A new facility or an existing facility attempting to burn their waste in boilers or industrial furnaces and planning to apply for a permit.

3) A facility currently burning hazardous waste in boilers or industrial furnaces planning to stay in compliance in accordance with the new regulation.

The guide book leads a hazardous waste manager through a series of steps that would help him stay in compliance.

With the increasing environmental awareness and stringent standards, any facility that treats or disposes hazardous waste should be extremely cautious, and be in constant touch with the changes in regulations and standards.

SECTION I

INTRODUCTION

Incineration of hazardous waste is an effective alternative for disposal of hazardous waste. It reduces the volume of waste and considerably reduces the risk due the hazardous waste. The process of incineration should be closely monitored to prevent any potentially dangerous emission.

Boilers and industrial furnaces until recently were expected to follow the permitting procedures, and emission and operating standards pertaining to incinerators. A new set of rules have been formulated for boilers and industrial furnaces, effective August 21. 1991.

EPA has recognized the fact that boilers and industrial furnaces should be treated differently. Even though the permitting procedure is no less tedious, there are certain exemptions that have been introduced in this rule which could be an advantage for a hazardous waste manager. An attempt is made in this paper to explain the new rule and to create a detailed step-by-step procedure to help a person involved in hazardous waste management to take advantage of the exemptions provided in the rule.

The paper is divided into four sections, the first is the introduction, in this section some background is provided for the reader to understand the need for this study. The second is the section on emission and performance standard,

this section clearly describes the emission and performance standards stipulated by the rule. The third section is the section pertaining to exemptions provided in the rule. The final section is a guide book for managers to follow if they plan to burn hazardous waste in their boiler and industrial furnaces or if they are already doing it. Boilers and industrial furnaces are terms that have been clearly defined in the regulation, appendix IX contains definitions for certain terms that are used frequently in the rule.

SECTION II

OPERATING AND EMISSION STANDARDS

The new regulation has clearly defined operating and emission standards. It is extremely important that a hazardous waste manager know these standards. Some of the standards proposed are fairly stringent. Most of the standards proposed are based on the risk to the health of human life that may be in the surroundings of the facility.

The initial part of the chapter is devoted to explaining the basis for the standards that have been established. The later part is the operating and emission standards.

BASIS FOR THE STANDARDS

Some of the risk assessment procedure used by EPA are explained in this section. EPA has used two different risk assessment procedures to handle carcinogenic metal and non-carcinogenic metal emissions. The emission for carcinogenic emissions is by risk specific doses (RSD), and, the emission for non-carcinogenic metals is by reference air concentrations (RAC). Regulation of emission of metals (carcinogenic and non-carcinogenic), and, hydrogen chloride and chlorine gas, is through a three tiered system. The three tiered system will be explained in detail in this section, specific emission standards will be discussed later in the chapter.

RISK SPECIFIC DOSES: The risk posed by carcinogenic emission is small but finite, even at relatively low concentrations. The emission standard is based on the risk to a hypothetical maximum exposed individual (MEI). The risk to the maximum exposed individual should not be more than 1 in 100,000. If more than one carcinogenic metal is present in the emission the risk per metal should not exceed 1 in 10,000.

MAXIMUM EXPOSED INDIVIDUAL: Is a person assumed to reside at a high exposure location 24 hours per day, 365 days per year, for a 70-year lifetime.

REFERENCE AIR CONCENTRATIONS: Is based on the oral reference dosage (RfD) for non-carcinogenic compounds listed in 40 CFR 261 appendix VIII. It has been derived assuming that 75% of the oral RfD level is due to background exposure and allows the boiler or industrial furnace to contribute up to 25%, except for Lead and HCl.

THREE TIERED SYSTEM: This system, as the name implies has three tiers, an owner or operator may choose to comply with any one of these tiers. Each tier has different testing and analysis standard, credit is given for more extensive testing and analysis in terms of higher allowable emission.

i) TIER I: Maximum allowable feedrate is based on the hazardous constituent in the waste being fed into the device. Thus no consideration is given for any loss (reduction in

emission) due to slag, air pollution control device, material recovery or for atmospheric dispersion. The only test required for this tier is analysis of the waste fed into the device. Thus worst possible emission and dispersion is assumed.

ii) TIER II: This tier requires emission testing for the listed hazardous constituents. Thus credit is given for slag, air pollution control devices, and, material recovery. A worst possible atmospheric dispersion is assumed.

iii) TIER III: This tier requires a site-specific dispersion modeling, in addition to the emission testing to predict an ambient air concentration of the hazardous constituent. Since, credit is given for atmospheric dispersion, in addition to the other losses, this tier allows for the maximum feed rate.

ORGANIC EMISSION STANDARDS (40 CFR 266.104)

Control of organic emission is attained by enforcing three basic standards they are:

a) Destruction and Removal efficiency (DRE) standard

b) CO standard

c) Alternative CO standard

DESTRUCTION AND REMOVAL EFFICIENCY STANDARD

The initial part of this section provides some background for the standard.

DESTRUCTION AND REMOVAL EFFICIENCY (DRE): This is the

efficiency with which the designated principal organic hazardous constituent is removed. The formula to calculate the DRE is as follows:

$$DRE = \left[\frac{1 - W_{out}}{W_{in}} \right] * 100$$

PRINCIPAL ORGANIC HAZARDOUS CONSTITUENT (POHC): Based on the degree of difficulty of destruction one or more organic compound in a waste stream will be designated as a POHC. The DRE should be calculated for the POHC.

DRE STANDARD: The DRE standard for all organic constituent is 99.99%. The DRE standard for dioxins is 99.9999% for every listed POHC. EPA hazardous waste no. F020, F021, F022, F023, F026, and, F027 are all dioxin containing wastes.

CO STANDARD

The levels of CO and Oxygen should be monitored continuously. The level of CO should not exceed 100 ppm by volume on an hourly rolling average basis (over any 60 minute period), continuously corrected to 7 percent Oxygen, dry gas basis.

ALTERNATIVE CO STANDARD

The above given CO standard may be exceeded if the hydrocarbon (HC) emission does not exceed 20 ppm by volume on

an hourly rolling average basis (over any 60 minute period), corrected to 7 percent Oxygen, dry gas basis. Owners and operators of industrial furnaces should comply with this standard, regardless of whether they meet the CO standard.

PARTICULATE MATTER EMISSION STANDARD (40 CFR 266.105)

Emission of particulate matter is of great concern because, particulate matter loaded with toxic compounds can cause considerable damage to human health. Other than the above stated reason, particulate matter is controlled more due to the fact that it is a nuisance.

The emission of particulate matter should not exceed 180 milligrams per dry standard cubic meter (0.08 grains per dry standard cubic foot) after correction to a stack gas concentration of 7% Oxygen.

TOXIC METAL EMISSION STANDARD (40 CFR 266.106)

The agency has identified twelve elements as toxic metals, and has established emission limits for ten of these. The standard is implemented through a three tiered approach, compliance with any of the tiers is acceptable. For toxic metal emission, credit is given for terrain and land use in the surrounding area in tier I and tier II. Toxic metal emission is classified as:

i) Carcinogenic metals

ii) Non-carcinogenic metals.

Since, the feed rate and emission rate for tier I and

tier II, respectively, is based on the terrain-adjusted effective stack height (TESH), the method of calculation of TESH is given as follows:

$$TESH = H_a + H_1 - T_r$$

H_a - Actual physical stack height

H_1 - Plume rise as determined from appendix V as a function of stack flow rate and stack gas exhaust temperature.

T_r - Terrain rise within five kilometers of the stack.

CARCINOGENIC METALS: These are metals that have a finite risk of causing cancer. Metals Arsenic, Cadmium, Beryllium, and Chromium have been classified as carcinogenic.

i) TIER I: In this tier emission is controlled by regulating the feed rate of a particular metal to the device. The only test required for this standard is the analysis of the waste feed for the quantity of carcinogenic and non-carcinogenic metal constituent. For non-carcinogenic metal the maximum feed rate is listed in appendix I. The maximum feed is listed in appendix I. If more than one carcinogenic metal has been found in the feed, the following equation should be used.

$$\sum_{i=1}^{n} \frac{X_i}{Y_i} \leq 1 \qquad (1)$$

n - number of carcinogenic metals

X - Actual feed rate to the device for the metal "i" (measured by testing the waste feed)

Y - Feed rate screening limit provided by appendix I for metal "i"

ii) TIER II: The emission is controlled by testing the emission from the device. The maximum emission is listed in appendix I. An emission testing for carcinogenic and non-carcinogenic metal constituents is a requirement. The maximum allowable emission rate for non-carcinogenic metal constituent is listed in appendix I. If more than one carcinogenic metal is detected in the waste stream the following equation should be used:

$$\sum_{i=1}^{n} \frac{X_i}{Y_i} \leq 1 \qquad (2)$$

n - number of carcinogenic metals

X - Actual emission rate for the metal "i" (measured from tests)

Y - Emission rate screening limit provided by appendix I for metal "i"

iii) TIER III: This tier requires a site-specific dispersion modeling in addition to emission testing. For carcinogenic metals maximum annual external air concentration should not exceed the risk specific dosage listed in appendix III.

NON-CARCINOGENIC METAL: These are metals that cause health

problems other than cancer (if exposed more than a certain level). The following are the metals classified as non-carcinogenic metals, Antimony, Barium, Lead, Mercury, Silver, and, Thallium. The tier I and tier II standards work the same way as they do for carcinogenic metals (but for looking up the chart in appendix I, the appropriate chart should be referred).

i) TIER III: This tier requires a site-specific dispersion modeling in addition to emission testing. For non-carcinogenic metals the maximum annual external air concentration of the waste listed in appendix VIII of 40 CFR 261 should not exceed the reference air concentration (RAC) listed in appendix IV.

HYDROGEN CHLORIDE AND CHLORINE GAS EMISSION STANDARDS
(40 CFR 266.107)

Control of Hydrogen Chloride (HCl) and Chlorine gas (Cl_2) is by a three tiered system. The maximum emission for each tier is based on the level of testing and analysis performed. An owner or operator may meet any one of these tiers.

i) TIER I: Control of emission is through the regulation of the feed to the device. Thus the only testing required is the analysis of the feed to the device. The maximum permissible feed is listed in appendix II, the feed varies based on the TESH and the complexity of the terrain. The method for calculation of TESH is the same as that of toxic

metal emission standard.

ii) TIER II: The maximum permissible feed is determined based on emission testing. The maximum permissible emission is listed in appendix II. An emission test for HCL and Cl_2 is required for this tier.

iii) TIER III: The tier requires a site-specific dispersion modelling in addition to emission testing. The maximum allowable emission is found out from reference air concentration (RAC) listed in appendix IV. The value for HCl and Cl_2 are as follows:

HCL - 7.0 micrograms per cubic meter

Cl_2 - 0.4 micrograms per cubic meter

SECTION III

EXEMPTIONS AND WAIVERS

The new regulation even though more stringent in terms of standards has certain exemptions. A manager has to have a thorough understanding of the rule, to take advantage of the exemptions and waivers. An in-depth study of the regulations has been made to highlight some of these exemptions. The small quantity burner exemption is the most radical exemption of all.

SMALL QUANTITY BURNER EXEMPTION (40 CFR 266.108)

If an owner or operator of a boiler or industrial furnace fulfills some of the requirements of the small quantity burner exemptions, the person may burn up to 1900 gallons of waste per month, without a permit. These are the restrictions

i) The waste should have a minimum heating value of 5000 Btu/lb as generated.

ii) The maximum firing rate of hazardous waste should not exceed 1% of the total fuel requirement for the device (hazardous waste plus other fuel) on a volume basis.

iii) The hazardous waste should not contain dioxins (EPA hazardous waste no. F020, F021, F022, F023, F026, or, F027).

NOTIFICATION AND RECORD KEEPING: A small quantity burner

need not have a permit to burn the waste, but there are certain notification and recordkeeping requirements they are:

i) A notification must be provided to EPA indicating the following information.

a) The unit is operating as a small quantity burner of hazardous waste.

b) The owner and operator are in compliance with the requirement.

c) The maximum quantity that the unit be burn in a month, with the relevant information (such as the EPA hazardous waste no., stack height, etc.,)

ii) Recording keeping requirement are quite simple, the Owner or the Operator must maintain at the facility at least three year records documenting compliance with the hazardous waste quantity, firing rate and the date fired, and, heating value limits.

LOW RISK WASTE EXEMPTION (40 CFR 266.109)

If the operator qualifies for this exemption the operator need not demonstrate compliance with DRE standard listed under toxic emission standard. The following are the requirement to qualify for this exemption.

i) A minimum of 50% of fuel fired should be fossil fuel, or fuels derived from fossil fuels.

ii) Primary fuel and hazardous waste should have a minimum as-fired heating value of 8000 Btu/lb.

iii) The device operates in conformance with the CO

standard listed under toxic emission standards, and, the facility does not qualify for alternative CO standard.

iv) The hazardous waste should be fired in the primary fuel flame zone.

The following information should be demonstrated in procedure.

i) Identify and quantify the non-metal compounds found in the waste from appendix VIII of 40 CFR 261 and reasons for exclusion of compound from the list.

ii) Calculate the worst possible emission rate assuming DRE as 99.9%.

iii) Perform emission dispersion modelling for all constituents to predict the maximum annual average ground level concentration.

iv) Predicted ground level concentration should be in conformance with risk specific dose (RSD) for carcinogenic compounds and reference air concentrations (RAC) for non-carcinogenic compounds. If the compound is not listed a standard of 0.1 microgram per cubic meter should be adopted.

WAIVER OF PARTICULATE MATTER (40 CFR 266.109)

The particulate matter standard does not if the following conditions are fulfilled.

i) The facility should qualify for the above mentioned low risk waste exemption.

ii) Should be operating under Tier I feed rates screening limits for toxic metals.

WAIVER OF DRE TRIAL BURN FOR BOILERS (40 CFR 266.110)

DRE trial burn is a lengthy procedure of proving to the director that the boiler in existence or to be installed is in confirmation with the DRE standard. The operator qualifying for this exemption does not have demonstrate compliance by a trial burn. The following are the requirement for a DRE trial burn exemption:

i) A minimum of 50% of fuel fired should be fossil fuel, or fuels derived from fossil fuels.

ii) Primary fuel and hazardous waste should have a minimum as-fired heating value of 8000 Btu/lb. Each of the material fired in a burner where the hazardous waste is fired must have a heating value of at least 8000 Btu/lb as fired.

iii) Boiler load should not be less than 40% at any time of operation.

iv) The device operates in conformance with the CO standard listed under toxic emission standards, and, the facility does not qualify for alternative CO standard.

v) The hazardous waste should be fired in the primary fuel flame zone with an air or steam atomization system, or a rotary cup atomization system under the following conditions:

a) VISCOSITY: of all the hazardous waste fuel as-fired should not exceed 300 SSU

b) PARTICLE SIZE: when a high pressure air or steam atomizer, low pressure atomizer, or mechanical atomizer is used, 70% of the hazardous waste fuel

must pass through a 200 mesh (74 micron) screen, and when a rotary cup atomizer is used, 70% of the hazardous waste must pass through a 100 mesh (150 micron) screen.

c) ATOMIZATION SYSTEMS: The fuel pressure and the other parameters should be maintained with the design limits.

SECTION IV

GUIDE BOOK

The guide book is written in a step-by-step manner in order to carry a manager through the steps involved in the process of treatment of hazardous waste in boilers and industrial furnaces. The following are the situations that have been studied to design the step-by-step procedure

1) A new facility or an existing facility attempting to use the small quantity burner exemption.

2) A new facility or an existing facility attempting to burn their waste in boilers or industrial furnaces and planning to apply for a permit.

3) A facility currently burning hazardous waste in boilers or industrial furnaces planning to stay in compliance in accordance with the new regulation.

The guide book is set up such that a step is given first with an explanation or additional information provided for the step following it.

CASE 1

This guide pertains to the situation presented first, that is, a new facility or an existing facility attempting to use the small quantity burner exemption. A manager must

follow the steps in the sequence described. The aim of this study is to reduce the paper work and the cost associated with the treatment of the waste through burning in furnaces or boilers.

STEP I: A DETAILED STUDY OF THE MANUFACTURING PROCESS AND THE RESULTING WASTE STREAMS.

This step is done in order to determine the waste streams resulting from the process and also to determine the possible hazardous waste present in the waste streams. A detailed study of the waste is important to show that only certain hazardous waste are present in the stream and that it may not be necessary to do an analysis for all the waste streams present in appendix VIII of 40 CFR 261.

STEP II: DETERMINE THE HEAT CONTENT OF THE WASTE STREAMS

This is done to determine the suitability for small quantity exemption. If the waste stream has a heat content of over 5000 btu/lb as generated, the stream can be considered for small quantity exemption.

STEP III: DETERMINE THE FUEL REQUIREMENT FOR THE BOILER OR INDUSTRIAL FURNACE

This value can be used to calculate the maximum amount of fuel that can be burnt under small quantity burner exemption. Since, at any given time the hazardous waste

being fired cannot exceed 1% of the total fuel and hazardous waste fired (by volume). If fuel requirement for the boiler or the industrial furnace is known the maximum hazardous waste that can be fired can be determined using the following formula

THW = FR/999

THW - Total hazardous waste that can be fired for 'x' period of time (by volume).

FR - Fuel requirement for 'x' period of time.

For example, if the fuel requirement for a furnace is 100 gallons/hr, then the total hazardous waste that can be fired for one hour

= 100/999 = 0.10001 gallons

STEP IV: SMALL QUANTITY BURNER EXEMPTION

If the facility qualifies for the use of small quantity burner exemption, the maximum allowable limit per month is determined based on the terrain adjusted effective stack height, and is listed in appendix VIII.

A one time notice should be sent to the EPA indicating the following information.

i) The unit is operating under small quantity burner exemption.

ii) A signed statement that the owner/operator is in compliance with the requirements.

iii) The maximum quantity of hazardous waste the facility expects to burn in a month.

The other requirement is that at least three year record of compliance with the regulation. The following information should be maintained in the record, the hazardous waste quantity, firing rate, and heating value limits.

The record that is maintained should be properly signed and dated by a responsible person, and, must be readily accessible. No attempts should be made at falsifying the record. If detected that could lead to severe penalties and possible criminal prosecutions.

CASE 2

This guide pertains to the situation presented second, that is, a new facility or an existing facility attempting to apply for a permit. Permitting is a fairly complicated procedure, an attempt has been made to simply the procedure by explaining it in a step-by-step manner. A manager must follow the steps in the order described in the paper. There are two parts to the permit application, one part pertains to the specific information on the hazardous waste to be burned and the other part pertains to the plan or results of the trial burn. A separate set of operating conditions should be obtained for every waste that is to be burned in the boiler or industrial furnace.

STEP I: A DETAILED STUDY OF THE MANUFACTURING PROCESS AND THE RESULTING WASTE STREAMS

This step is done in order to determine the waste resulting from the process and also to establish the possible hazardous waste present in the waste stream. A detailed study of the waste is important to show that only certain wastes are present in the stream and it would not be necessary to do an analysis for all the waste streams present in appendix VIII of 40 CFR 261.

STEP II: INFORMATION REGARDING EXEMPTIONS

If any exemption or waiver is being adopted a detailed plan of the conditions to meet the wavier or exemption should be attached. The permissible exemptions are as follows

a) Waiver of trial burn for DRE

b) Low risk waste exemption

c) Waiver of trial burn for particulate matter

These exemptions and waivers have been discussed in the chapter pertaining to exemptions and waivers.

STEP III: TRIAL BURN PLAN

A manager or operator of the facility should submit a trial burn plan, to manifest how the person intends to meet the operating and emission standards. This will be reviewed by the director and the trial burn requirements will be proposed. The preparation of the trail burn plan is a detailed procedure, it involves extensive analysis. The following are the information that should be provided in the trial burn plan.

a) An analysis of all feed streams, including hazardous waste, other fuels, and, industrial feed stocks, as fired. A format for this part of the plan has been designed and is presented in the appendix VI.

b) A description of the blending procedure, if any. Blending ratio and information of the fuels being blended also needs to be provided.

c) A detailed engineering description of the boiler or the industrial furnace. An example sheet has been attached in appendix VII.

d) Detailed description of sampling and monitoring procedures. This should include sampling and monitoring locations in the system, the equipment to be used, sampling and monitoring frequency, and planned analytical procedures for sample analysis.

e) A detailed test schedule for each hazardous waste. It should contains information such as trial burns planned, including dates, duration, quantity of hazardous waste to be burned, and other relevant facts.

f) The test procedure to be adopted should be attached, listing the quantity of hazardous waste, the mixing ratios to be tested, and, all parameters that would affect the burning of the waste.

g) Operational conditions for emission control devices.

h) Procedures for rapidly stopping the hazardous waste feed and controlling emissions in the event of equipment malfunction.

The trial burn plan will be approved by the Director if he/she is convinced that the trial will not cause damage to human life or the environment. The Director has the right to all the information from the trial burn and additional information if he/she should deem it necessary.

STEP IV: DETERMINATIONS BASED ON THE TRIAL BURN

Once the trial burn is complete, all the results from the trial burn should be submitted to the Director and additional statement submitted should be signed by the person authorized to sign the permit application. Following are the information that should be determined from the trial burn:

a) A quantitative analysis of the levels of Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Lead, Mercury, Thallium, Silver, and, Chlorine/Chloride, in the feed stock, waste stream, and, the fuels.

b) Information required to calculate the trial DRE.

c) Calculate DRE for Dioxins if present.

d) Information showing conformance with all emission standards.

e) Analysis of scrubber water, ash residue, and other residues to determine the fate of POHCs, metals, Chlorine/Chlorides, etc.,

f) A continuous measurement of Carbon monoxide (CO), Oxygen and hydrocarbons in stack.

After all this information is submitted to the Director a through analysis of the data is made before operating

standards are fixed for a particular hazardous waste. Additional analysis and tests may be required as determined by the director. **CASE 3**

This case deals with a facility currently burning hazardous waste in boilers or industrial furnaces planning to be in compliance in accordance with the new regulation. A step-by-step procedure is designed to carry the manager through some of the basic steps that need to be performed.

A facility that is existing and is currently burning hazardous waste in boilers and industrial furnaces or a facility with a permit to build a boiler or industrial furnace, qualify for the interim status, until they meet the permit requirement of the new rule or the closure of the device. A facility that qualifies for interim status should apply for precompliance on or before August 21, 1991. The facility unlike a new facility has until August 21, 1992, to submit compliance with the new regulation. A facility that attempts to qualify for an interim status has certain restrictions they are:

a) Dioxin listed waste are prohibited from burning, they are EPA hazardous waste no. F020, F021, F022, F023, F026, or, F027.

b) In a furnace burning hazardous waste other than as a ingredient the following restrictions apply:

i) Combustion gas temperature should at least be

1800^0F at the spot of injection of hazardous waste.

ii) In cement kilns the hazardous waste should be fed into the kiln.

c) Hazardous waste with less than 5000 Btu/lb should not be fed in as a fuel.

d) If the concentration of nonmetal compound listed under 40 CFR 261 appendix VIII is greater than 500ppm by weight, then, it is considered to be burned for destruction.

e) If the heat content is greater than 5000 Btu/lb as generated then the fuel is considered to be burnt for fuel.

As mentioned earlier a facility that qualifies for interim status should file a certification of precompliance on or before August 21, 1991.

STEP I: CERTIFICATION OF PRECOMPLIANCE

A certificate should be issued by the owner or the operator of the facility certifying that the facility is operating within the operating requirements of the rule. In order write up a certificate of precompliance the facility should determine the operating condition under which it should operate. So, the step of certification of precompliance can be divided into two parts. The first part will be the setting of operating limits and the second being the actual process of certification.

Part 1: Set operating limits

All information regarding the total hazardous waste that

is intended to be burnt, and the hazardous constituents in the hazardous waste should be determined. Based on the above mentioned information operating limits should be designed. Designing the operating limits involves checking if the facility can meet all operating and emission standards, and determining which tier it plans to meet.

Part 2: Certification process

Following information should be attached with the certificate:

a) EPA facility ID number.

b) Facility name, contact person, telephone number, and address.

c) Technical information about the boiler or the industrial furnace, all information required in the data sheet provided in appendix VII should be provided.

b) All supporting information to show that the facility is in compliance with the emission screening limits for metals, total chlorine and chloride, and, particulate matter. After this certificate is filed a public notice should be issued in a major local newspaper before the effective data of the rule. This notification should be titled "Notice of Certification of Precompliance with Hazardous Waste Burning requirement of 40 CFR 266.103(b)". It should include the following information:

a) Name and address of the owner and operator of the facility as well as the location of the device burning the hazardous waste. b) Date that the certification of

precompliance is submitted to the Director.

c) Brief descriptions of the regulatory process and the step taken to meet all the emission standards.

d) Type of hazardous waste, quantities, the physical state of the hazardous, and, the sources of the hazardous waste.

e) Type of the device the waste will be burnt and the quantities, type and quantities of fuels to be added to the waste and if it is a furnace the feed stock.

f) A brief description of the basis of certification of precompliance.

g) Location where these records can be viewed, which should be an address where interested parties can make copies of the records.

h) Additional information the location of regional EPA office and further information on how interested parties can be included on the company mailing list.

A facility may change its operating requirements any number of times but should file a certification of precompliance every time, before it changes its operating conditions.

STEP II: CERTIFICATION OF COMPLIANCE

The owner or operator should conduct emission testing to document compliance with all emission standards, based on this information, the person should file an accurate certification for compliance establishing the operating

limits. The dead line for filing certification for compliance is August 21, 1992.

During the period of precompliance the owner or operator of the facility should conduct a compliance test. The detailed procedure for this test is provided in 40 CFR 266.103(c)(3). A notice should be issue 30 prior to the conduct of the compliance test. The notice should contain the following information:

a) EPA facility ID number.

b) Facility name, contact person, telephone number, and address.

c) Person responsible for conducting the testing all the credentials regarding the person.

d) Planned date of compliance test and the testing schedule.

e) A plan of the facility including the making of the area where the test is to be conducted.

f) Technical information regarding the device that is being tested, it should also include information about the air pollution control devices, continuous emission monitors, stacks, etc.,

The certificate of compliance should be submitted within 90 days of the testing for compliance. The owner or operator should provide all the information collected from the compliance test, all the information to show that the facility is in compliance with emission and operating standards. A certification of compliance statement should be

attached with all the information that is to be provided it should be signed by the person responsible to sign the permit application. The statement goes as follows:

"I certify under penalty of law that this information was prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gathered and evaluated the information and supporting documentation. Copies of all emissions tests, dispersion modeling results and other information used to determine conformance with the requirements of 40 CFR 266.103(c) are available at the facility and can be obtained from the facility contact person listed above. Based on my inquiry of the person or persons who manages the facility, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true accurate, and complete. I am aware of that there are significant penalty for submitting false information, including the possibility of fine and imprisonment for knowing violations. I also acknowledge that the operating conditions established in this certification pursuant to 40 CFR 266.103(c)(4)(iv) are enforceable limits at which the facility can legally operate during interim status until revised certification of compliance is submitted."

REFERENCES

1) Federal Register, 40 CFR parts 260, 261, 264, 265, 266, 270, and, 271, Burning of Hazardous Waste in Boilers and Industrial Furnaces; Final Rule.

2) Hazardous Waste Management (Text book) Volume I & II, Dr. Turner, C. Wayne, Oklahoma State University, Sept 1991.

APPENDIX I

TABLE I–A.—TIER I AND TIER II FEED RATE AND EMISSIONS SCREENING LIMITS FOR CARCINOGENIC METALS FOR FACILITIES IN NONCOMPLEX TERRAIN

[Values for urban areas]

Terrain adjusted eff. stack ht. (m)	Antimony (g/hr)	Barium (g/hr)	Lead (g/hr)	Mercury (g/hr)	Silver (g/hr)	Thallium (g/hr)
4	6.0E+01	1.0E+04	1.8E+01	6.0E+01	6.0E+02	6.0E+01
6	6.8E+01	1.1E+04	2.0E+01	6.8E+01	6.8E+02	6.8E+01
8	7.6E+01	1.3E+04	2.3E+01	7.6E+01	7.6E+02	7.6E+01
10	8.6E+01	1.4E+04	2.6E+01	8.6E+01	8.6E+02	8.6E+01
12	9.6E+01	1.7E+04	3.0E+01	9.6E+01	9.6E+02	9.6E+01
14	1.1E+02	1.8E+04	3.4E+01	1.1E+02	1.1E+03	1.1E+02
16	1.3E+02	2.1E+04	3.6E+01	1.3E+02	1.3E+03	1.3E+02
18	1.4E+02	2.4E+04	4.3E+01	1.4E+02	1.4E+03	1.4E+02
20	1.6E+02	2.7E+04	4.6E+01	1.6E+02	1.6E+03	1.6E+02
22	1.8E+02	3.0E+04	5.4E+01	1.8E+02	1.8E+03	1.8E+02
24	2.0E+02	3.4E+04	6.0E+01	2.0E+02	2.0E+03	2.0E+02
26	2.3E+02	3.9E+04	6.8E+01	2.3E+02	2.3E+03	2.3E+02
28	2.6E+02	4.3E+04	7.8E+01	2.6E+02	2.6E+03	2.6E+02
30	3.0E+02	5.0E+04	9.0E+01	3.0E+02	3.0E+03	3.0E+02
35	4.0E+02	6.6E+04	1.1E+02	4.0E+02	4.0E+03	4.0E+02
40	4.6E+02	7.8E+04	1.4E+02	4.6E+02	4.6E+03	4.6E+02
45	6.0E+02	1.0E+05	1.8E+02	6.0E+02	6.0E+03	6.0E+02
50	7.8E+02	1.3E+05	2.3E+02	7.8E+02	7.8E+03	7.8E+02
55	9.6E+02	1.7E+05	3.0E+02	9.6E+02	9.6E+03	9.6E+02
60	1.2E+03	2.0E+05	3.6E+02	1.2E+03	1.2E+04	1.2E+03
65	1.5E+03	2.5E+05	4.3E+02	1.5E+03	1.5E+04	1.5E+03
70	1.7E+03	2.8E+05	5.0E+02	1.7E+03	1.7E+04	1.7E+03
75	1.9E+03	3.2E+05	5.8E+02	1.9E+03	1.9E+04	1.9E+03
80	2.2E+03	3.6E+05	6.4E+02	2.2E+03	2.2E+04	2.2E+03
85	2.5E+03	4.0E+05	7.6E+02	2.5E+03	2.5E+04	2.5E+03
90	2.8E+03	4.6E+05	8.2E+02	2.8E+03	2.8E+04	2.8E+03
95	3.2E+03	5.4E+05	9.6E+02	3.2E+03	3.2E+04	3.2E+03
100	3.6E+03	6.0E+05	1.1E+03	3.6E+03	3.6E+04	3.6E+03
105	4.0E+03	6.8E+05	1.2E+03	4.0E+03	4.0E+04	4.0E+03
110	4.6E+03	7.8E+05	1.4E+03	4.6E+03	4.6E+04	4.6E+03
115	5.4E+03	8.6E+05	1.6E+03	5.4E+03	5.4E+04	5.4E+03
120	6.0E+03	1.0E+06	1.8E+03	6.0E+03	6.0E+04	6.0E+03

TABLE I–B.—TIER I AND TIER II FEED RATE AND EMISSIONS SCREENING LIMITS FOR NONCARCINOGENIC METALS FOR FACILITIES IN NONCOMPLEX TERRAIN

[Values for rural areas]

Terrain adjusted eff. stack ht. (m)	Antimony (g/hr)	Barium (g/hr)	Lead (g/hr)	Mercury (g/hr)	Silver (g/hr)	Thallium (g/hr)
4	3.1E+01	5.2E+03	9.4E+00	3.1E+01	3.1E+02	3.1E+01
6	3.6E+01	6.0E+03	1.1E+01	3.6E+01	3.6E+02	3.6E+01
8	4.0E+01	6.8E+03	1.2E+01	4.0E+01	4.0E+02	4.0E+01
10	4.6E+01	7.8E+03	1.4E+01	4.6E+01	4.6E+02	4.6E+01
12	5.8E+01	9.6E+03	1.7E+01	5.8E+01	5.8E+02	5.8E+01
14	6.8E+01	1.1E+04	2.1E+01	6.8E+01	6.8E+02	6.8E+01
16	8.6E+01	1.4E+04	2.6E+01	8.6E+01	8.6E+02	8.6E+01
18	1.1E+02	1.8E+04	3.2E+01	1.1E+02	1.1E+03	1.1E+02
20	1.3E+02	2.2E+04	4.0E+01	1.3E+02	1.3E+03	1.3E+02
22	1.7E+02	2.8E+04	5.0E+01	1.7E+02	1.7E+03	1.7E+02
24	2.2E+02	3.6E+04	6.4E+01	2.2E+02	2.2E+03	2.2E+02
26	2.8E+02	4.6E+04	8.2E+01	2.8E+02	2.8E+03	2.8E+02
28	3.5E+02	5.8E+04	1.0E+02	3.5E+02	3.5E+03	3.5E+02
30	4.3E+02	7.6E+04	1.3E+02	4.3E+02	4.3E+03	4.3E+02
35	7.2E+02	1.2E+05	2.1E+02	7.2E+02	7.2E+03	7.2E+02
40	1.1E+03	1.8E+05	3.2E+02	1.1E+03	1.1E+04	1.1E+03
45	1.5E+03	2.5E+05	4.6E+02	1.5E+03	1.5E+04	1.5E+03
50	2.0E+03	3.3E+05	6.0E+02	2.0E+03	2.0E+04	2.0E+03
55	2.6E+03	4.4E+05	7.8E+02	2.6E+03	2.6E+04	2.6E+03
60	3.4E+03	5.8E+05	1.0E+03	3.4E+03	3.4E+04	3.4E+03
65	4.6E+03	7.6E+05	1.4E+03	4.6E+03	4.6E+04	4.6E+03
70	5.4E+03	9.0E+05	1.6E+03	5.4E+03	5.4E+04	5.4E+03
75	6.4E+03	1.1E+06	1.9E+03	6.4E+03	6.4E+04	6.4E+03
80	7.6E+03	1.3E+06	2.3E+03	7.6E+03	7.6E+04	7.6E+03
85	9.4E+03	1.5E+06	2.8E+03	9.4E+03	9.4E+04	9.4E+03
90	1.1E+04	1.8E+06	3.3E+03	1.1E+04	1.1E+05	1.1E+04
95	1.3E+04	2.2E+06	3.9E+03	1.3E+04	1.3E+05	1.3E+04
100	1.5E+04	2.6E+06	4.6E+03	1.5E+04	1.5E+05	1.5E+04
105	1.8E+04	3.0E+06	5.4E+03	1.8E+04	1.8E+05	1.8E+04
110	2.2E+04	3.6E+06	6.6E+03	2.2E+04	2.2E+05	2.2E+04
115	2.6E+04	4.4E+06	7.8E+03	2.6E+04	2.6E+05	2.6E+04
120	3.1E+04	5.0E+06	9.2E+03	3.1E+04	3.1E+05	3.1E+04

TABLE I-C.—TIER I AND TIER II FEED RATE AND EMISSIONS SCREENING LIMITS FOR NONCARCINOGENIC METALS FOR FACILITIES IN COMPLEX TERRAIN

Values for urban and rural areas

Terrain adjusted eff. stack ht. (m)	Antimony (g/hr)	Barium (g/hr)	Lead (g/hr)	Mercury (g/hr)	Silver (g/hr)	Thallium (g/hr)
4	1.4E+01	2.4E+03	4.3E+00	1.4E+01	1.4E+02	1.4E+01
6	2.1E+01	3.5E+03	6.2E+00	2.1E+01	2.1E+02	2.1E+01
8	3.0E+01	5.0E+03	9.2E+00	3.0E+01	3.0E+02	3.0E+01
10	4.3E+01	7.6E+03	1.3E+01	4.3E+01	4.3E+02	4.3E+01
12	5.4E+01	9.0E+03	1.7E+01	5.4E+01	5.4E+02	5.4E+01
14	6.8E+01	1.1E+04	2.0E+01	6.8E+01	6.8E+02	6.8E+01
16	7.8E+01	1.3E+04	2.4E+01	7.8E+01	7.8E+02	7.8E+01
18	8.6E+01	1.4E+04	2.6E+01	8.6E+01	8.6E+02	8.6E+01
20	9.6E+01	1.6E+04	2.9E+01	9.6E+01	9.6E+02	9.6E+01
22	1.0E+02	1.8E+04	3.2E+01	1.0E+02	1.0E+03	1.0E-
24	1.2E+02	1.9E+04	3.5E+01	1.2E+02	1.2E+03	1.2E-
26	1.3E+02	2.2E+04	3.6E+01	1.3E+02	1.3E+03	1.3E-
28	1.4E+02	2.4E+04	4.3E+01	1.4E+02	1.4E+03	1.4E+
30	1.6E+02	2.7E+04	4.6E+01	1.6E+02	1.6E+03	1.6E+02
35	2.0E+02	3.3E+04	5.8E+01	2.0E+02	2.0E+03	2.0E+02
40	2.4E+02	4.0E+04	7.2E+01	2.4E+02	2.4E+03	2.4E+02
45	3.0E-02	5.0E+04	9.0E+01	3.0E+02	3.0E+03	3.0E+02
50	3.6E+02	6.0E+04	1.1E+02	3.6E+02	3.6E+03	3.6E+02
55	4.6E-02	7.6E+04	1.4E+02	4.6E+02	4.6E+03	4.6E+02
60	5.8E+02	9.4E+04	1.7E+02	5.8E+02	5.8E+03	5.8E-02
65	6.8E+02	1.1E+05	2.1E+02	6.8E+02	6.8E+03	6.8E+02
70	7.8E+02	1.3E+05	2.4E+02	7.8E+02	7.8E+03	7.8E+02
75	8.6E+02	1.4E+05	2.6E+02	8.6E+02	8.6E+03	8.6E+02
80	9.6E+02	1.6E+05	2.9E+02	9.6E+02	9.6E+03	9.6E+02
85	1.1E+03	1.8E+05	3.3E+02	1.1E+03	1.1E+04	1.1E+03
90	1.2E+03	2.0E+05	3.6E+02	1.2E+03	1.2E+04	1.2E+03
95	1.4E+03	2.3E+05	4.0E+02	1.4E+03	1.4E+04	1.4E+03
100	1.5E+03	2.6E+05	4.6E+02	1.5E+03	1.5E+04	1.5E+03
105	1.7E+03	2.8E+05	5.0E+02	1.7E+03	1.7E+04	1.7E+03
110	1.9E+03	3.2E+05	5.8E+02	1.9E+03	1.9E+04	1.9E+03
115	2.1E+03	3.6E+05	6.4E+02	2.1E+03	2.1E+04	2.1E+03
120	2.4E+03	4.0E+05	7.2E+02	2.4E+03	2.4E+04	2.4E+03

TABLE I–D.—TIER I AND TIER II FEED RATE AND EMISSIONS SCREENING LIMITS FOR CARCINOGENIC METALS FOR FACILITIES IN NONCOMPLEX TERRAIN

	Values for use in urban areas			Values for use in rural areas				
Terrain adjusted eff. stack ht. (m)	Arsenic (g/hr)	Cadmium (g/hr)	Chromium (g/hr)	Beryllium (g/hr)	Arsenic (g/hr)	Cadmium (g/hr)	Chromium (g/hr)	Beryllium (g/hr)
4	4.6E−01	1.1E+00	1.7E−01	8.2E−01	2.4E−01	5.8E−01	8.6E−02	4.3E−01
6	5.4E−01	1.3E+00	1.9E−01	9.4E−01	2.8E−01	6.6E−01	1.0E−01	5.0E−01
8	6.0E−01	1.4E+00	2.2E−01	1.1E+00	3.2E−01	7.6E−01	1.1E−01	5.6E−01
10	6.8E−01	1.6E+00	2.4E−01	1.2E+00	3.6E−01	8.6E−01	1.3E−01	6.4E−01
12	7.6E−01	1.8E+00	2.7E−01	1.4E+00	4.3E−01	1.1E+00	1.6E−01	7.8E−01
14	8.6E−01	2.1E+00	3.1E−01	1.5E+00	5.4E−01	1.3E+00	2.0E−01	9.8E−01
16	9.6E+01	2.3E+00	3.5E−01	1.7E+00	6.8E−01	1.6E+00	2.4E−01	1.2E+00
18	1.1E+00	2.6E+00	4.0E−01	2.0E+00	8.2E−01	2.0E+00	3.0E−01	1.5E+00
20	1.2E+00	3.0E+00	4.4E−01	2.2E+00	1.0E+00	2.5E+00	3.7E−01	1.9E+00
22	1.4E+00	3.4E+00	5.0E−01	2.5E+00	1.3E+00	3.2E+00	4.8E−01	2.4E+00
24	1.6E+00	3.9E+00	5.8E−01	2.8E+00	1.7E+00	4.0E+00	6.0E−01	3.0E+00
26	1.8E+00	4.3E+00	6.4E−01	3.2E+00	2.1E+00	5.0E+00	7.6E−01	3.9E+00
28	2.0E+00	4.8E+00	7.2E−01	3.6E+00	2.7E+00	6.4E+00	9.8E−01	5.0E+00
30	2.3E+00	5.4E+00	8.2E−01	4.0E+00	3.5E+00	8.2E+00	1.2E+00	6.2E+00
35	3.0E+00	6.8E+00	1.0E+00	5.4E+00	5.4E+00	1.3E+01	1.9E+00	9.6E+00
40	3.6E+00	9.0E+00	1.3E+00	6.8E+00	8.2E+00	2.0E+01	3.0E+00	1.5E+01
45	4.6E+00	1.1E+01	1.7E+00	8.6E+00	1.1E+01	2.8E+01	4.2E+00	2.1E+01
50	6.0E+00	1.4E+01	2.2E+00	1.1E+01	1.5E+01	3.7E+01	5.4E+00	2.8E+01
55	7.6E+00	1.8E+01	2.7E+00	1.4E+01	2.0E+01	5.0E+01	7.2E+00	3.6E+01
60	9.4E+00	2.2E+01	3.4E+00	1.7E+01	2.7E+01	6.4E+01	9.6E+00	4.8E+01
65	1.1E+01	2.8E+01	4.2E+00	2.1E+01	3.6E+01	8.6E+01	1.3E+01	6.4E+01
70	1.3E+01	3.1E+01	4.6E+00	2.4E+01	4.3E+01	1.0E+02	1.5E+01	7.6E+01
75	1.5E+01	3.6E+01	5.4E+00	2.7E+01	5.0E+01	1.2E+02	1.8E+01	9.0E+01
80	1.7E+01	4.0E+01	6.0E+00	3.0E+01	6.0E+01	1.4E+02	2.2E+01	1.1E+02
85	1.9E+01	4.6E+01	6.8E+00	3.4E+01	7.2E+01	1.7E+02	2.6E+01	1.3E+02
90	2.2E+01	5.0E+01	7.8E+00	3.9E+01	8.6E+01	2.0E+02	3.0E+01	1.5E+02
95	2.5E+01	5.8E+01	9.0E+00	4.4E+01	1.0E+02	2.4E+02	3.6E+01	1.8E+02
100	2.8E+01	6.8E+01	1.0E+01	5.0E+01	1.2E+02	2.9E+02	4.3E+01	2.2E+02
105	3.2E+01	7.6E+01	1.1E+01	5.6E+01	1.4E+02	3.4E+02	5.0E+01	2.6E+02
110	3.6E+01	8.6E+01	1.3E+01	6.4E+01	1.7E+02	4.0E+02	6.0E+01	3.0E+02
115	4.0E+01	9.8E+01	1.5E+01	7.2E+01	2.0E+02	4.8E+02	7.2E+01	3.6E+02
120	4.6E+01	1.1E+02	1.7E+01	8.2E+01	2.4E+02	5.8E+02	8.6E+01	4.3E+02

TABLE I–E.—TIER I AND TIER II FEED RATE AND EMISSIONS SCREENING LIMITS FOR CARCINOGENIC METALS FOR FACILITIES IN COMPLEX TERRAIN

	Values for use in urban and rural areas			
Terrain adjusted eff. stack ht. (m)	Arsenic (g/hr)	Cadmium (g/hr)	Chromium (g/hr)	Beryllium (g/hr)
4	1.1E−01	2.6E−01	4.0E−02	2.0E−01
6	1.6E−01	3.9E−01	5.8E−02	2.9E−01
8	2.4E−01	5.8E−01	8.6E−02	4.3E−01
10	3.5E−01	8.2E−01	1.3E−01	6.2E−01
12	4.3−01	1.0E+00	1.5E−01	7.8E−01
14	5.0E−01	1.3E+00	1.9E−01	9.4E−01
16	6.0E−01	1.4E+00	2.2E−01	1.1E+00
18	6.8E−01	1.6E+00	2.4E−01	1.2E+00
20	7.6E−01	1.8E+00	2.7E−01	1.3E+00
22	8.2E−01	1.9E+00	3.0E−01	1.5E+00
24	9.0E−01	2.1E+00	3.3E−01	1.6E+00
26	1.0E+00	2.4E+00	3.6E−01	1.8E+00
28	1.1E+00	2.7E+00	4.0E−01	2.0E+00
30	1.2E+00	3.0E+00	4.4E−01	2.2E+00
35	1.5E+00	3.7E+00	5.4E−01	2.7E+00
40	1.9E+00	4.6E+00	6.8E−01	3.4E+00
45	2.4E+00	5.4E+00	8.4E−01	4.2E+00
50	2.9E+00	6.8E+00	1.0E+00	5.0E+00
55	3.5E+00	8.4E+00	1.3E+00	6.4E+00
60	4.3E+00	1.0E+01	1.5E+00	7.8E+00
65	5.4E+00	1.3E+01	1.9E+00	9.8E+00
70	6.0E+00	1.4E+01	2.2E+00	1.1E+01
75	6.8E+00	1.6E+01	2.4E+00	1.2E+01
80	7.6E+00	1.8E+01	2.7E+00	1.3E+01
85	8.2E+00	2.0E+01	3.0E+00	1.5E+01
90	9.4E+00	2.3E+01	3.4E+00	1.7E+01
95	1.0E+01	2.5E+01	4.0E+00	1.9E+01
100	1.2E+01	2.8E+01	4.3E+00	2.1E+01
105	1.3E+01	3.2E+01	4.8E+00	2.4E+01
110	1.5E+01	3.5E+01	5.4E+00	2.7E+01
115	1.7E+01	4.0E+01	6.0E+00	3.0E+01
120	1.9E+01	4.4E+01	6.4E+00	3.3E+01

APPENDIX II

Appedix II.—Tier I Feed Rate Screening Limits for Total Chlorine and Chloride

TIER I FEED RATE SCREENING LIMITS FOR CHLORINE FOR FACILITIES IN NONCOMPLEX AND COMPLEX TERRAIN

Terrain-adjusted effective stack height (m)	Noncomplex		Complex
	Urban (lb/hr)	Rural (lb/hr)	(lb/hr)
4	1.8E−02	9.2E−03	4.1E−03
6	2.0E−02	1.0E−02	6.1E−03
8	2.2E−02	1.2E−02	9.0E−03
10	2.5E−02	1.4E−02	1.3E−02
12	2.9E−02	1.7E−02	1.6E−02
14	3.3E−02	2.0E−02	2.0E−02
16	3.7E−02	2.5E−02	2.3E−02
18	4.1E−02	3.2E−02	2.5E−02
20	4.7E−02	3.9E−02	2.9E−02
22	5.3E−02	5.0E−02	3.1E−02
24	6.0E−02	6.3E−02	3.5E−02
26	6.8E−02	8.1E−02	3.8E−02
28	7.6E−02	1.0E−01	4.2E−02
30	8.7E−02	1.3E−01	4.7E−02
35	1.2E−01	2.1E−01	5.9E−02
40	1.4E−01	3.2E−01	7.2E−02
45	1.8E−01	4.4E−01	8.8E−02
50	2.3E−01	5.8E−01	1.1E−01
55	2.9E−01	7.7E−01	1.4E−01
60	3.5E−01	1.0E+00	1.7E−01
65	4.3E−01	1.4E+00	2.0E−01
70	5.0E−01	1.6E+00	2.3E−01
75	5.6E−01	1.9E+00	2.5E−01
80	6.3E−01	2.2E+00	2.9E−01
85	7.3E−01	2.8E+00	3.2E−01
90	8.3E−1	3.2E+00	3.6E−01
95	9.3E−01	3.8E+00	4.0E−01
100	1.1E+00	4.6E+00	4.4E−01
105	1.2E+00	5.4E+00	5.0E−01
110	1.4E+00	6.5E+00	5.6E−01
115	1.6E+00	7.7E+00	6.2E−01
120	1.8E+00	9.1E+00	7.1E−01

Appendix III.—Tier II Emission Rate Screening Limits for Free Chlorine and Hydrogen Chloride

TIER II EMISSIONS SCREENING LIMITS FOR Cl_2 AND HCl IN NONCOMPLEX TERRAIN

Terrain-adjusted effective stack height (m)	Values for use in urban areas		Values for use in rural areas	
	Cl_2 (g/sec)	HCl (g/sec)	Cl_2 (g/sec)	HCl (g/sec)
4	2.3E−03	4.0E−01	1.2E−03	2.0E−01
6	2.5E−03	4.4E−01	1.3E−03	2.3E−01
8	2.8E−03	4.9E−01	1.5E−03	2.6E−01
10	3.2E−03	5.6E−01	1.7E−03	3.0E−01
12	3.6E−03	6.3E−01	2.1E−03	3.7E−01
14	4.1E−03	7.2E−01	2.5E−03	4.4E−01
16	4.7E−03	8.2E−01	3.2E−03	5.6E−01
18	5.2E−03	9.1E−01	4.0E−03	7.0E−01
20	5.9E−03	1.0E+00	4.9E−03	8.6E−01
22	6.7E−03	1.2E+00	6.2E−03	1.1E+00
24	7.6E−03	1.3E+00	8.0E−03	1.4E+00
26	8.5E−03	1.5E+00	1.0E−02	1.8E+00
28	9.6E−03	1.7E+00	1.3E−02	2.3E+00
30	1.1E−02	1.9E+00	1.6E−02	2.8E+00
35	1.5E−02	2.6E+00	2.7E−02	4.7E+00
40	1.7E−02	3.0E+00	4.0E−02	7.0E−00
45	2.3E−02	4.0E+00	5.6E−02	9.8E+00
50	2.9E−02	5.1E+00	7.3E−02	1.3E+01
55	3.6E−02	6.3E+00	9.7E.02	1.7E+01
60	4.5E−02	7.9E+00	1.3E−01	2.2E+01
65	5.5E−02	9.6E+00	1.7E−01	3.0E+01
70	6.3E−02	1.1E+01	2.0E−01	3.5E+01
75	7.1E−02	1.2E+01	2.4E−01	4.2E+01
80	8.0E−02	1.4E+01	2.8E−01	4.9E+01
85	9.2E−02	1.6E+01	3.5E−01	6.1E+01
90	1.0E−01	1.8E+01	4.0E−01	7.0E+01
95	1.2E−01	2.1E+01	4.8E−01	8.4E+01

TIER II EMISSIONS SCREENING LIMITS FOR Cl_2 AND HCl IN NONCOMPLEX TERRAIN—Continued

Terrain-adjusted effective stack height (m)	Values for use in urban areas		Values for use in rural areas	
	Cl_2 (g/sec)	HCl (g/sec)	Cl_2 (g/sec)	HCl (g/sec)
100	1.3E−01	2.3E+01	5.7E−01	1.0E+02
105	1.5E−01	2.6E+01	6.8E−01	1.2E+02
110	1.7E−01	3.0E+01	8.1E−01	1.4E+02
115	2.0E−01	3.5E+01	9.7E−01	1.7E+02
120	2.3E−01	4.0E+01	1.1E+00	2.0E+02

TIER II EMISSIONS SCREENING LIMITS FOR Cl_2 AND HCl IN COMPLEX TERRAIN

Terrain-adjusted effective stack height (m)	Values for use in urban and rural areas	
	Cl_2 (g/sec)	HCl (g/sec)
4	5.2E−04	9.1E−02
6	7.7E−04	1.4E−01
8	1.1E−03	2.0E−01
10	1.6E−03	2.8E−01
12	2.0E−03	3.5E−01
14	2.5E−03	4.4E−01
16	2.9E−03	5.1E−01
18	3.2E−03	5.6E−01
20	3.6E−03	6.3E−01
22	3.9E−03	6.8E−01
24	4.4E−03	7.7E−01
26	4.8E−03	8.4E−01
28	5.3E−03	9.3E−01
30	5.9E−03	1.0E+00
35	7.3E−03	1.3E+00
40	9.1E−03	1.6E+00
45	1.1E−02	1.9E+00
50	1.3E−02	2.3E+00
55	1.7E−02	3.0E+00
60	2.1E−02	3.7E+00
65	2.5E−02	4.4E+00
70	2.9E−02	5.1E+00
75	3.2E−02	5.6E+00
80	3.6E−02	6.3E+00
85	4.0E−02	7.0E+00
90	4.5E−02	7.9E+00
95	5.1E−02	8.9E+00
100	5.6E−02	9.8E+00
105	6.3E−02	1.1E+01
110	7.1E−02	1.2E+01
115	7.9E−02	1.4E+01
120	8.9E−02	1.6E+01

APPENDIX III

APPENDIX V.—RISK SPECIFIC DOSES (10^{-5})—Continued

Constituent	CAS No.	Unit risk (m3/ug)	RsD (ug/m3)
Chlordane	57-74-9	3.7E-04	2.7E-02
Chloroform	67-66-3	2.3E-05	4.3E-01
Chloromethane	74-87-3	3.6E-06	2.8E+00
Chromium VI	7440-47-3	1.2E-02	8.3E-04
DDT	50-29-3	9.7E-05	1.0E-01
Dibenz(a,h)anthracene	53-70-3	1.4E-02	7.1E-04
1,2-Dibromo-3-chloropropane	96-12-8	6.3E-03	1.6E-03
1,2-Dibromoethane	106-93-4	2.2E-04	4.5E-02
1,1-Dichloroethane	75-34-3	2.6E-05	3.8E-01
1,2-Dichloroethane	107-06-2	2.6E-05	3.8E-01
1,1-Dichloroethylene	75-35-4	5.0E-05	2.0E-01
1,3-Dichloropropene	542-75-6	3.5E-01	2.9E-05
Dieldrin	60-57-1	4.6E-03	2.2E-03
Diethylstilbestrol	56-53-1	1.4E-01	7.1E-05
Dimethylnitrosamine	62-75-9	1.4E-02	7.1E-04
2,4-Dinitrotoluene	121-14-2	8.8E-05	1.1E-01
1,2-Diphenylhydrazine	122-66-7	2.2E-04	4.5E-02
1,4-Dioxane	123-91-1	1.4E-05	7.1E+00
Epichlorohydrin	106-89-8	1.2E-06	8.3E+00
Ethylene Oxide	75-21-8	1.0E-04	1.0E-01
Ethylene Dibromide	106-93-4	2.2E-04	4.5E-02

APPENDIX V.—RISK SPECIFIC DOSES (10^{-5})—Continued

Constituent	CAS No.	Unit risk (m3/ug)	RsD (ug/m3)
Formaldehyde	50-00-0	1.3E-05	7.7E-01
Heptachlor	76-44-8	1.3E-03	7.7E-03
Heptachlor Epoxide	1024-57-3	2.6E-03	3.8E-03
Hexachlorobenzene	118-74-1	4.9E-04	2.0E-02
Hexachlorobutadiene	87-68-3	2.0E-05	5.0E-01
Alpha-hexachlorocyclohexane	319-84-6	1.8E-03	5.6E-03
Beta-hexachlorocyclohexane	319-85-7	5.3E-04	1.9E-02
Gamma-hexachlorocyclohexane	58-89-9	3.8E-04	2.6E-02
Hexachlorocyclohexane, Technical		5.1E-04	2.0E-02
Hexachlorodibenxo-p-dioxin(1,2 Mixture)		1.3E+0	7.7E-06
Hexachloroethane	67-72-1	4.0E-06	2.5E+00
Hydrazine	302-01-2	2.9E-03	3.4E-03
Hydrazine Sulfate	302-01-2	2.9E-03	3.4E-03
3-Methylcholanthrene	56-49-5	2.7E-03	3.7E-03
Methyl Hydrazine	60-34-4	3.1E-04	3.2E-02
Methylene Chloride	75-09-2	4.1E-06	2.4E+00
4,4'-Methylene-bis-2-chloroaniline	101-14-4	4.7E-05	2.1E-01
Nickel	7440-02-0	2.4E-04	4.2E-02
Nickel Refinery Dust	7440-02-0	2.4E-04	4.2E-02

APPENDIX V.—RISK SPECIFIC DOSES (10^{-5})—Continued

Constituent	CAS No.	Unit risk (m3/ug)	RsD (ug/m3)
Nickel Subsulfide	12035-72-2	4.8E-04	2.1E-02
2-Nitropropane	79-46-9	2.7E-02	3.7E-04
N-Nitroso-n-butylamine	924-16-3	1.6E-03	6.3E-03
N-Nitroso-n-methylurea	684-93-5	8.6E-02	1.2E-04
N-Nitrosodiethylamine	55-18-5	4.3E-02	2.3E-04
N-Nitrosopyrrolidine	930-55-2	6.1E-04	1.6E-02
Pentachloronitrobenzene	82-68-8	7.3E-05	1.4E-01
PCBs	1336-36-3	1.2E-03	8.3E-03
Pronamide	23950-58-5	4.6E-06	2.2E-00
Reserpine	50-55-5	3.0E-03	3.3E-03
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	4.5E-01	2.2E-07
1,1,2,2-Tetrachloroethane	79-34-5	5.8E-05	1.7E-01
Tetrachloroethylene	127-18-4	4.8E-07	2.1E+01
Thiourea	62-56-6	5.5E-04	1.8E-02
1,1,2-Trichloroethane	79-00-5	1.6E-05	6.3E-01
Trichloroethylene	79-01-6	1.3E-06	7.7E+00
2,4,6-Trichlorophenol	88-06-2	5.7E-06	1.8E+00
Toxaphene	8001-35-2	3.2E-04	3.1E-02
Vinyl Chloride	75-01-4	7.1E-06	1.4E+00

APPENDIX V.—RISK SPECIFIC DOSES (10^{-5})

Constituent	CAS No.	Unit risk (m3/ug)	RsD (ug/m3)
Acrylamide	79-06-1	1.3E-03	7.7E-03
Acrylonitrile	107-13-1	6.8E-05	1.5E-01
Aldrin	309-00-2	4.9E-03	2.0E-03
Aniline	62-53-3	7.4E-06	1.4E+00
Arsenic	7440-38-2	4.3E-03	2.3E-03
Benz(a)anthracene	56-55-3	8.9E-04	1.1E-02
Benzene	71-43-2	8.3E-06	1.2E+00
Benzidine	92-87-5	6.7E-02	1.5E-04
Benzo(a)pyrene	50-32-8	3.3E-03	3.0E-03
Beryllium	7440-41-7	2.4E-03	4.2E-03
Bis(2-chloroethyl)ether	111-44-4	3.3E-04	3.0E-02
Bis(chloromethyl)ether	542-88-1	6.2E-02	1.6E-04
Bis(2-ethylhexyl)-phthalate	117-81-7	2.4E-07	4.2E+01
1,3-Butadiene	106-99-0	2.8E-04	3.6E-02
Cadmium	7440-43-9	1.8E-03	5.6E-03
Carbon Tetrachloride	56-23-5	1.5E-05	6.7E-01

APPENDIX IV

APPENDIX IV.—REFERENCE AIR CONCENTRATIONS*

Constituent	CAS No	RAC (ug/m³)
Acetaldehyde	75-07-0	10
Acetonitrile	75-05-8	10
Acetophenone	98-86-2	100
Acrolein	107-02-8	20
Aldicarb	116-06-3	1
Aluminum Phosphide	20859-73-8	0.3
Allyl Alcohol	107-18-6	5
Antimony	7440-36-0	0.3
Barium	7440-39-3	50
Barium Cyanide	542-62-1	50
Bromomethane	74-83-9	0.8
Calcium Cyanide	592-01-8	30
Carbon Disulfide	75-15-0	200
Chloral	75-87-6	2
Chlorine (free)		0.4
2-Chloro-1,3-butadiene	126-99-8	3
Chromium III	16065-83-1	1000
Copper Cyanide	544-92-3	5
Cresols	1319-77-3	50
Cumene	98-82-8	1
Cyanide (free)	57-12-15	20
Cyanogen	460-19-5	30
Cyanogen Bromide	506-68-3	80
Di-n-butyl Phthalate	84-74-2	100
o-Dichlorobenzene	95-50-1	10
p-Dichlorobenzene	106-46-7	10
Dichlorodifluoromethane	75-71-8	200
2,4-Dichlorophenol	120-83-2	3
Diethyl Phthalate	84-66-2	800
Dimethoate	60-51-5	0.8
2,4-Dinitrophenol	51-28-5	2
Dinoseb	88-85-7	0.9
Diphenylamine	122-39-4	20
Endosulfan	115-29-1	0.05
Endrin	72-20-8	0.3
Fluorine	7782-41-4	50
Formic Acid	64-18-6	2000
Glycidylaldehyde	765-34-4	0.3
Hexachlorocyclopentadiene	77-47-4	5
Hexachlorophene	70-30-4	0.3
Hydrocyanic Acid	74-90-8	20
Hydrogen Chloride	7647-01-1	7
Hydrogen Sulfide	7783-06-4	3
Isobutyl Alcohol	78-83-1	300
Lead	7439-92-1	0.09
Maleic Anyhdride	108-31-6	100
Mercury	7439-97-6	0.3
Methacrylonitrile	126-98-7	0.1
Methomyl	16752-77-5	20
Methoxychlor	72-43-5	50
Methyl Chlorocarbonate	79-22-1	1000
Methyl Ethyl Ketone	78-93-3	80
Metyl Parathion	298-00-0	0.3
Nickel Cyanide	557-19-7	20
Nitric Oxide	10102-43-9	100
Nitrobenzene	98-95-3	0.8
Pentachlorobenzene	608-93-5	0.8
Pentachlorophenol	87-86-5	30
Phenol	108-95-2	30
M-Phenylenediamine	108-45-2	5
Phenylmercuric Acetate	62-38-4	0.075
Phosphine	7803-51-2	0.3
Phthalic Anhydride	85-44-9	2000
Potassium Cyanide	151-50-8	50
Potassium Silver Cyanide	506-61-6	200
Pyridine	110-86-1	1
Selenious Acid	7783-80-8	3
Selenoures	630-10-4	6
Silver	7440-22-4	3
Silver Cyanide	506-64-9	100
Sodium Cyanide	143-33-9	30
Strychnine	57-24-9	0.3
1,2,4,5-Tetrachlorobenzene	95-94-3	0.3
2,3,4,6-Tetrachlorophenol	58-90-2	30
Tetraethyl Lead	78-00-2	0.0001
Tetrahydrofuran	109-99-9	10
Thallic Oxide	1314-32-5	0.3
Thallium	7440-28-0	0.5
Thallium (I) Acetate	563-68-8	0.5
Thallium (I) Carbonate	6533-73-9	0.3
Thallium (I) Chloride	7791-12-0	0.3
Thallium (I) Nitrate	10102-45-1	0.5
Thallium Selenite	12039-52-0	0.5
Thallium (I) Sulfate	7446-18-6	0.075
Thiram	137-26-8	5
Toluene	108-88-3	300
1,2,4-Trichlorobenzene	120-82-1	20
Trichloromonofluoromethane	75-69-4	300
2,4,5-Trichlorophenol	95-95-4	100
Vanadium Pentoxide	1314-62-1	20
Warfarin	81-81-2	0.3
Xylenes	1330-20-7	80
Zinc Cyanide	557-21-1	50
Zinc Phosphide	1314-84-7	0.3

*The RAC for other Appendix VIII Part 261 constituents not listed herein or in Appendix V of this Part is 0.1 ug/m³.

APPENDIX V

APPENDIX VI.—STACK PLUME RISE

[Estimated Plume Rise (in Meters) Based on Stack Exit Flow Rate and Gas Temperature]

Flow rate (m3/s)	Exhaust Temperature (K°)										
	<325	325–349	350–399	400–449	450–499	500–599	600–699	700–799	800–999	1000–1499	>1499
<0.5	0	0	0	0	0	0	0	0	0	0	0
0.5–0.9	0	0	0	0	0	0	0	0	1	1	1
1.0–1.9	0	0	0	0	1	1	2	3	3	3	4
2.0–2.9	0	0	1	3	4	4	6	6	7	8	9
3.0–3.9	0	1	2	5	6	7	9	10	11	12	13
4.0–4.9	1	2	4	6	8	10	12	13	14	15	17
5.0–7.4	2	3	5	8	10	12	14	16	17	19	21
7.5–9.9	3	5	8	12	15	17	20	22	22	23	24
10.0–12.4	4	6	10	15	19	21	23	24	25	26	27
12.5–14.9	4	7	12	18	22	23	25	26	27	28	29
15.0–19.9	5	8	13	20	23	24	26	27	28	29	31
20.0–24.9	6	10	17	23	25	27	29	30	31	32	34
25.0–29.9	7	12	20	25	27	29	31	32	33	35	36
30.0–34.9	8	14	22	26	29	31	33	35	36	37	39
35.0–39.9	9	16	23	28	30	32	35	36	37	39	41
40.0–49.9	10	17	24	29	32	34	36	38	39	41	42
50.0–59.9	12	21	26	31	34	36	39	41	42	44	46
60.0–69.9	14	22	27	33	36	39	42	43	45	47	49
70.0–79.9	16	23	29	35	38	41	44	46	47	49	51
80.0–89.9	17	25	30	36	40	42	46	48	49	51	54
90.0–99.9	19	26	31	38	42	44	48	50	51	53	56
100.0–119.9	21	28	32	39	43	46	49	52	53	55	58
120.0–139.9	22	28	35	42	46	49	52	55	56	59	61
140.0–159.9	23	30	36	44	48	51	55	58	59	62	65
160.0–179.9	25	31	38	46	50	54	58	60	62	65	67
180.0–199.9	26	32	40	48	52	56	60	63	65	67	70
>199.9	26	33	41	49	54	58	62	65	67	69	73

APPENDIX VI

CHEMICAL ANALYSIS

HAZARDOUS WASTE

All hazardous waste that could be expected to be present in the waste stream should be listed. Concentration of Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Lead, Mercury, Silver, Thallium, total Chlorine/Chloride, and ash should be listed.

NAME	HEATING VALUE (UNITS)	CONCENTRATION (UNITS)	VISCOSITY /PHYSICAL FORM
WASTE X			
WASTE Z			

FUELS

The following information should be provided for all forms of fuels to be used with the hazardous waste.

NAME	HEATING VALUE (UNITS)	CONCENTRATION (UNITS)	VISCOSITY /PHYSICAL FORM
FUEL NO.2			
FUEL NO.3			

INDUSTRIAL FEED STOCK

If the person is planning to burn the hazardous waste in an industrial furnace this information should be provided.

NAME	HEATING VALUE (UNITS)	CONCENTRATION (UNITS)	VISCOSITY /PHYSICAL FORM
FEED STOCK A			

APPENDIX VII

BOILER/INDUSTRIAL FURNACE DATA SHEET

MANUFACTURER'S NAME :

MODEL NO.:

TYPE :

MAXIMUM DESIGN CAPACITY :

DESCRIPTION OF FEED SYSTEM :
(Fuel or feed stock based
on the device)

CAPACITY OF HAZARDOUS
WASTE FEED SYSTEM :

DESCRIPTION OF AUTOMATIC
HAZARDOUS WASTE CUTOFF SYSTEM(S) :

DESCRIPTION OF POLLUTION
CONTROL SYSTEM :

DESCRIPTION OF STACK GAS AND
POLLUTION CONTROL MONITERING SYSTEM :

APPENDIX VIII

EXEMPT QUANTITIES FOR SMALL QUANTITY BURNER EXEMPTION

Terrain-adjusted effective stack height of device (meters)	Allowable hazardous waste burning rate (gallons/month)	Terrain-adjusted effective stack height of device (meters)	Allowable hazardous waste burning rate (Gallons/month)
0 to 3.9	0	40.0 to 44.9	210
4.0 to 5.9	13	45.0 to 49.9	260
6.0 to 7.9	18	50.0 to 54.9	330
8.0 to 9.9	27	55.0 to 59.9	400
10.0 11.9	40	60.0 to 64.9	490
12.0 to 13.9	48	65.0 to 69.9	610
14.0 to 15.9	59	70.0 to 74.9	680
16.0 to 17.9	69	75.0 to 79.9	760
18.0 to 19.9	76	80.0 to 84.9	860
20.0 to 21.9	84	85.0 to 89.9	960
22.0 to 23.9	93	90.0 to 94.9	1,100
24.0 to 25.9	100	95.0 to 99.9	1,200
26.0 to 27.9	110	100.0 to 104.9	1,300
28.0 to 29.9	130	105.0 to 109.9	1,500
30.0 to 34.9	140	110.0 to 114.9	1,700
35.0 to 39.9	170	115.0 or greater.	1,900

APPENDIX IX

DEFINITIONS

BOILER means an enclosed device using controlled flame combustion and having the following characteristics:

(1)(i) The unit must have physical provisions for recovering and exporting thermal energy in the form of steam, heated fluids, or heated gases; and

(ii) The unit's combustion chamber and primary energy recovery section(s) must be of integral design. To be of integral design, the combustion chamber and the primary energy recovery section(s) (such as waterwalls and superheaters) must be physically formed into one manufactured or Assembled unit. A unit in which the combustion chamber and the primary energy recovery section(s) are joined only by ducts or connections carrying flue gas is not integrally designed; however, secondary energy recovery equipment (such as economizers or air preheaters) need not be physically formed into the same unit as the combustion chamber and the primary energy recovery section. The following units are not precluded from being boilers solely because they are not of integral design: process heaters (units that transfer energy directly to a process steam), and fluidized bed combustion units; and

(iii) While in operation, the unit must maintain a thermal energy recovery efficiency of at least 60 percent, calculated in terms of the recovered energy compared with the thermal value of the fuel; and

(iv) The unit must export and utilize at least 75% of the recovered energy, calculated on an annual basis. In calculation, no credit shall be given for recovered heat used internally in the same unit. (Examples of internal use are the preheating of fuel or combustion air, and the driving of induced or forced draft fans or feedwater pumps); or

(2) The unit is one which the Regional Administrator has determined, on a case_by_case basis, to be a boiler, after considering the standards in 40 CFR 260.32.

INCINERATOR means any enclosed device using controlled flame combustion that neither meets the criteria for classification as a boiler nor is listed as an industrial furnace

INDUSTRIAL FURNACE means any of the following enclosed devices that are integral components of manufacturing processes and that use controlled flame devices to accomplish recovery of materials or energy;

(1) Cement kilns

(2) Lime kilns

(3) Aggregate kilns

(4) Phosphate kilns

(5) Coke ovens

(6) Blast furnaces

(7) Smelting, melting, and, refining furnaces (including pyrometallurgical devices such as cupolas,

reverberator furnaces, sintering machine, roasters, and foundry furnaces)

(8) Titanium dioxide chloride process oxidation reactors

(9) Methane reforming furnaces

(10) Pulping liquor recovery furnaces

(11) Combustion devices used in the recovery of sulfur values from spend sulfuric acid

(12) Such other devices as the Administrator may, after notice and comment, add to this list on the basis of one or more of the following factors:

(i) The design and use of the device primarily to accomplish recovery of material products;

(ii) The use of the device to burn or reduce raw materials to make a material product;

(iii) The use of the device to burn or reduce secondary materials as effective substitutes for raw materials, in processes using raw materials as principal feedstocks;

(iv) The use of the device to burn or reduce secondary materials as ingredients in an industrial process to make a material product;

(v) The use of the device in common industrial practice to produce a material product; and

(vi) Other factors, as appropriate.