STATE OF MINNESOTA
MINNESOTA POLLUTION CONTROL AGENCY

In the Matter of the Proposed Rules Governing Waste Combustor Permits, and the Standards of Performance of Waste Combustors

STATEMENT OF NEED AND REASONABLENESS

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I. INTRODUCTION

Waste combustors are incineration facilities which burn waste, including municipal solid waste (MSW), refuse derived fuel (RDF), and industrial wastes. Industrial wastes can include industrial sludges, commercial wastes, and medical wastes including infectious or pathological wastes. Crematoria, and metal recovery incinerators are also waste combustors. Waste combustors emit air pollutants when combusting wastes.

The Minnesota Pollution Control Agency (MPCA) has information and data which shows that incineration of wastes results in emissions of air pollutants which, if uncontrolled and unregulated, can have a negative impact on human health and the environment. Minnesota's current rules governing the incineration of wastes, were first adopted in 1969, and revised once in 1976. They are found at Minn. Rules pts. 7011.1201 to 7011.1207. The current rules do not regulate construction, operation and emissions from waste combustors based on current information and data.

The MPCA is proposing these rules to comprehensively regulate the construction, operation and emissions of waste combustors in Minnesota in order to minimize the negative impact of waste incineration on human health and the environment.

II. STATEMENT OF MPCA'S STATUTORY AUTHORITY

The MPCA's authority to adopt the rules is set forth in Minn. Stat. § 116.07, subd. 4 (1992), which provides:

> Pursuant and subject to the provisions of chapter 14, and the provisions hereof, the pollution control agency may adopt, amend and rescind rules and standards having the force of law relating to any purpose within the provision of Laws 1969, chapter 1046, for the prevention, abatement, or control of air pollution. Any such rule or standard may be of general application throughout the state, or may be limited as to times, places, circumstances, or conditions in order to make due allowance for variations therein.
>
> Without limitation, rules or standards may relate to sources of emissions of air contamination or air pollution, the quality or composition of such emissions, or to the quality of or composition of the ambient air or outdoor atmosphere or to any other matter relevant to the prevention, abatement, or control of air pollution.
>
> Pursuant and subject to the provisions of chapter 14, and the provisions hereof, the pollution control agency may adopt, amend and rescind rules and standards having the force of law relating to any purpose within the provision of Laws 1969, chapter 1049, for the collection, transportation, storage, processing, and disposal of solid waste and the prevention, abatement, or control of water, air and land pollution which may be related thereto.
>
> Without limitation, rules or standards may relate to collection, transportation, processing, disposal, equipment, location, procedures, methods, systems or techniques or to any other matter relevant to the prevention, abatement or control of water, air, and land pollution which may be advised through the collection, transportation, processing, and disposal of solid waste.

III. STATEMENT OF NEED FOR THE REVISED RULES

Minn. Stat. ch. 14 (1992) requires the MPCA to make an affirmative presentation of facts establishing the need for and reasonableness of rules as proposed. To the extent that need and reasonableness are separate, need has come to mean that a problem exists which requires administrative attention. Reasonableness means that there is a rational basis for the MPCA's proposal. It is the opposite of arbitrary and capricious.

The proposed rules are needed for three reasons: to minimize the emissions from waste combustors in Minnesota, to incorporate state statutory requirements affecting waste combustor permit development and monitoring and to adopt federal emission guidelines and regulations for municipal waste combustors (MWC).

A. THE NEED TO MINIMIZE AIR EMISSIONS FROM WASTE COMBUSTORS IN MINNESOTA

The existing state incinerator rules, Minn. Rules pts. 7011.1201 to 7011.1207, were developed and adopted by the MPCA in 1969. The existing rules set emission standards for particulate matter (PM) and opacity, require the operation of an afterburner at a minimum temperature of 1,200 degrees Fahrenheit with a minimum stack gas retention time of 0.3 seconds, and require the owner or operator to record the daily charging rate and hours of operation (Appendix1).

Further control of emissions from waste combustion is needed for three reasons:

- large amounts of waste are being combusted in Minnesota;
-current information regarding emissions from waste combustors shows there is reason to be concerned about the combustors' emissions;
-experience with existing rules has demonstrated that they are not effective in controlling most air pollutants emitted from waste combustors.

Each of these are addressed separately below.

1. Waste Combustion in Minnesota

At the time the MPCA solid waste rules went into effect in 1988, Minnesota had 86 landfill sites remaining. The Minnesota Legislature in 1989 enacted a statute that allowed operating MSW landfills to quit operating on July 1, 1990, in order to the avoid financial assurance requirements of the new solid waste rules. Minn. Stat. § 115A.923 (1992). On July 1, 1990, 34 landfills took advantage of the financial assurance grace period and closed, leaving 53 MSW landfills operating in Minnesota.

At 1989 land filling rates, Minnesota has five to six years of landfill capacity remaining at these 53 landfills. The land filling rate is projected to slow down slightly, due in part to the recent start-up of the Hennepin Energy Resource Corporation (HERC) and United Power Association (UPA) municipal waste combustors. Also, waste diversion activities, such as yard waste diversion, will impact the land filling rates. Waste reduction is projected to have little impact on land filling rates. The amount of waste generated in Minnesota is expected to increase, not decrease (Ref. 1).

Minnesota has the capacity to combust about 1.6 million tons of MSW in 12 MWCs per year. The processing capacity can also be reflected as the number of tons combusted each day (tons/day or TPD). In Minnesota, there is 4,624 TPD of operating MWC capacity. With the startup of Dakota County's currently permitted MWC, there could be another 500 tons per day of capacity, giving Minnesota a total of 5,124 TPD of MSW combustion capacity. Minnesota generates about 11,000 TPD (4 million tons per year) of MSW, meaning that currently (without Dakota County's facility) up to about 40 percent of Minnesota's MSW could be incinerated.

Comparatively, this capacity is high for this region. MPCA staff reviewed the Integrated Waste Services Association's inventory of waste combustors in United States to determine what are typical capacities for municipal waste combustion (Ref. 2). Minnesota was compared to other midwestern states. The state of Illinois, the most populous midwestern state, has one operating MWC, with another recently permitted, giving that state only two MWCs. Michigan, the next most populous midwestern state, has 5 MWCs, for a total combustion capacity of 7,625 tons per day. Michigan has a population of about 9 million people, giving that state a municipal waste combustion capacity of .0008 tons of MSW combustion capacity per person in the state of Michigan. Minnesota's 4 million citizens have about 0.0013 tons of MSW combustion capacity per person, the highest in the midwest region of the United States. Nationally, only New York state has more municipal waste combustor capacity per capita than Minnesota.

The vast majority of the waste combustors operated in Minnesota are unpermitted units. These units are located primarily in residential areas at grocery stores, homes, retail and commercial businesses, hospitals, schools, nursing homes and other institutional facilities.

Review of MPCA Air Quality's Compliance Data System, which contains information on large, known air emissions sources in Minnesota, shows that the largest number of known waste combustors currently operating in Minnesota is found in grocery stores (Table 1). The next largest group is that of commercial/retail waste combustors, followed by hospitals and nursing homes, industrial, institutional, municipal and governmental agency-owned waste combustors.

Table 1. Identified Waste Combustors in Minnesota

Waste Combustor Source Type	**Number**
Grocery Stores	231
Commercial/Retail	199
Commercial/Industrial	25
Hospitals	40
Nursing Homes	20
Institutional	70
Municipal Solid Waste	12
Medical Waste (commercial)	1
Government	10
Crematoriums	15
Feedlots/Animal Operations	Unknown
Metal Recovery Units	10
TOTAL	**637**

The MPCA believes that the total number of waste combustors operating in Minnesota is much higher than the known waste combustors represented above. According to the Minnesota Grocers' Association, (MGA) there are about 3000 grocery stores in Minnesota. The MGA estimated that 25 to 33 percent of these grocery stores operate incinerators, meaning there could be as many as 1000 grocery store waste combustors alone.[1] Because of the variations in waste management programs administered by Minnesota counties and the waste collection services

1 Telephone conversation between Mr. John Olson of the Minnesota Grocers' Association and Ms. Anne Jackson of the MPCA on July 31, 1989.

provided by those programs, the MPCA estimates that there are 1300 on-site incinerators located at medical facilities, businesses, industries, and institutions throughout Minnesota. This figure is about one-third again as many have been identified in the MPCA installation logs.

Without proper controls, waste combustors are significant sources of toxic emissions. Municipal waste combustion was not a source of these emissions in Minnesota before 1982 when the first municipal waste combustor was permitted by the MPCA. The recent permitting of these sources has addressed the control of some of the toxic emissions, but overall, these facilities are new source of substantial quantities of air toxics, particularly mercury (Hg). Small, on-site waste combustors are not permitted, and so their emissions continue unabated. The amount of waste combusted, and their emissions, is significant and requires control.

2. Waste Combustor Emissions

It is well known that combustion of solid and liquid wastes has an impact on air quality. Facilities that burn waste emit particulate matter, acid gases, nitrogen oxides, metals, and organics and generate ash residue. Some of the emissions have been evaluated for toxicity by the U.S. Environmental Protection Agency (EPA) and others, and some have been designated criteria pollutants under the Clean Air Act of 1977. The Clean Air Act Amendments of 1990 identified 189 substances that are to be considered hazardous until EPA evaluates their toxicity. Other substances present in waste combustor flue gases generally are thought or suspected to exhibit toxic health effects in some concentrations but have not been evaluated or listed as toxic or hazardous.

a. Criteria Pollutant Emissions

Criteria pollutants designated under the Clean Air Act of 1977 and in Minn. Rules pt. 7005.0100, subp. 8A, are particulate matter, carbon monoxide, sulfur dioxide, ozone, lead and nitrogen oxides. Criteria pollutants, specifically particulate matter and nitrogen oxides, constitute the largest quantity of currently regulated pollutants from waste combustors. Very high particulate matter control efficiencies have been achieved at waste combustors. Focus is now on how to effectively control noncriteria pollutants.

b. Toxic Air Emissions

There are three types of toxic air pollutants emitted by waste combustors: metals, organics and acid gases. The three types of toxic air pollutants are described in greater detail below.

EPA has promulgated regulations to control certain air toxics emissions from specific sources. Since 1977, the process to develop national emissions standards for hazardous air pollutants (NESHAPs) under the 1977 Clean Air Act amendments has resulted in standards for a number of toxic air pollutants, but none of them apply to waste combustors.

The concern with toxic air pollutants lies in the potential for environmental and human health effects from exposure to these pollutants. Both short-term and long-term human health effects need to be considered. Basically, short-term effects are eye irritation, respiratory irritation and short-term central nervous system effects such as nausea and headache, which are caused by exposure to certain concentrations of pollutants. Long-term effects are both cancer and noncancer adverse effects which result from exposure to pollutants over a lifetime.

1. Metals

Metals which are routinely found in the emissions of waste combustors include arsenic, beryllium, cadmium, chromium, lead, mercury and nickel. These metals are used in the manufacture of some consumer products and are found as incidental trace constituents in virtually all materials including yard and garden wastes. Metals of most concern are those which are environmentally-persistent and are associated with toxic effects. Two examples of persistent and toxic metals are lead and mercury.

(a) Lead Contamination

Lead was recognized early as a persistent toxin. Lead exposure to a fetus via exposure of a mother may cause preterm birth, reduced birth weight, and decreased intelligence quotient (IQ) in the infant. Lead exposure may also decrease IQ scores of young children. Lead exposure may increase blood pressure in middle-aged men. At high levels of exposure, lead can severely damage the brain and kidneys in adults and children. The effects of lead are the same regardless of whether it enters the body through breathing or ingestion. (Ref. 3). Lead is one of the six criteria pollutants designated under the Clean Air Act of 1977, and ambient air quality standards for lead have been established by EPA (40 CFR 50.12). Because lead is present in the waste stream combusted at waste combustors, it will be emitted into the air if not controlled through pollution control equipment or removed from the waste stream. The evidence is clear that unchecked lead emissions are harmful to human health.

(b) Mercury Contamination

Mercury is an environmental problem primarily because it can bioaccumulate in the aquatic food chain to the point that consumption of fish is hazardous to birds and mammals, including humans. Direct exposure to elevated concentrations of mercury vapor can also be hazardous, but such concentrations are only likely to occur in enclosed industrial facilities that handle mercury. The issue addressed here is that even small environmental releases of mercury can have a significant negative effect both locally and, in aggregate, globally. Small amounts of mercury can be significant because the concentration of mercury increases to a high degree as it is passed along the aquatic food chain. For instance, the average concentration of mercury in a northeastern Minnesota lake is about 2 nanograms per liter (ng/L), and the average concentration in a 22 inch northern pike is about 450 nanograms per gram, a bioconcentration factor of 225,000 (Ref. 4).

The bioconcentration of mercury leads to situations that some people may find surprising. For instance, humans can easily tolerate direct exposure to environmental concentrations that result in unacceptable concentrations at the top of the food chain. In other words, it may be okay to drink a lake's water where it would be unhealthy to eat the fish. The EPA drinking water standard for mercury of 2,000 ng/L (Code of Federal Regulations Title 40 Part 141 subpart B & G and Part 143), is far above Minnesota's ambient water standard of 7 ng/L (MN Rules part 7050.0220) that is designed to protect humans from the consumption of contaminated fish. It is likely that the ambient standard of 7 ng/L should be even lower, given that water concentrations of 2 ng/L is associated with fish concentrations of 450 ng/g, three times higher than 160 ng/g, a level corresponding to one meal per week consumption advice for pregnant women (Ref. 5).

Mercury (Hg) is an unusual element in that it sometimes has the characteristics of a metal and sometimes of an organic compound. Mercury is like other metals in that it is an element, so that it is persistent in the environment, being destroyed neither by combustion nor bacterial degradation. Mercury is like an organic compound in that it has (1) an ability to bioconcentrate through food chains and (2) a significant vapor phase under normal atmospheric conditions. These characteristics in combination mean that mercury is a mobile yet persistent toxic material that can be magnified through food chains.

These negative environmental characteristics are at odds with mercury's unusual properties that make it useful and difficult to replace in products such as fluorescent lamps, batteries, thermostats, and switches. Aside from its useful electrical properties, mercury is also used as a fungicide and/or preservative (on golf courses, in pharmaceuticals, and, until 1991, in latex paint). Anthropogenic (human generated) sources not only include release during the manufacture, use, and disposal of these products, but also incidental release during the combustion of coal, oil, natural gas, and wood (and wood products such as paper). Any process that heats large quantities of any material will release significant quantities of mercury, because (1) mercury is present in trace concentrations in all natural substances and (2) mercury is highly volatile upon heating.

Aquatic food chains can become contaminated with mercury either from a point source, such as a water discharge from an industrial facility, or from atmospheric deposition.

Undeveloped lakes in northeastern Minnesota possess fish contaminated with mercury that was transported to the area by the atmosphere. Geological sources of mercury in northeastern Minnesota are negligible compared to atmospheric sources (Ref. 6). Atmospheric deposition can occur directly to the lake's surface or to the soils in the watershed that drains to the lake. Organic matter in soils has a high affinity for mercury (Ref. 7), so that 10 to 30% of the mercury deposited to a lake's watershed is transported to the lake (Refs. 8,9, and 10). Ultimately, most of the mercury retained by the watershed soils is volatilized back to the atmosphere (see Atmospheric Transport section, below). The volatility of mercury implies that mercury introduced anywhere into the environment, including landfills, soil application, and surface water discharges, has the potential to volatilize and be deposited elsewhere. Therefore land and water disposal of mercury could be regarded as air sources, if the appropriate volatilization rates were known. This approach is further complicated by down-stream transport of mercury discharged to rivers and the virtually permanent burial of mercury in lake sediments.

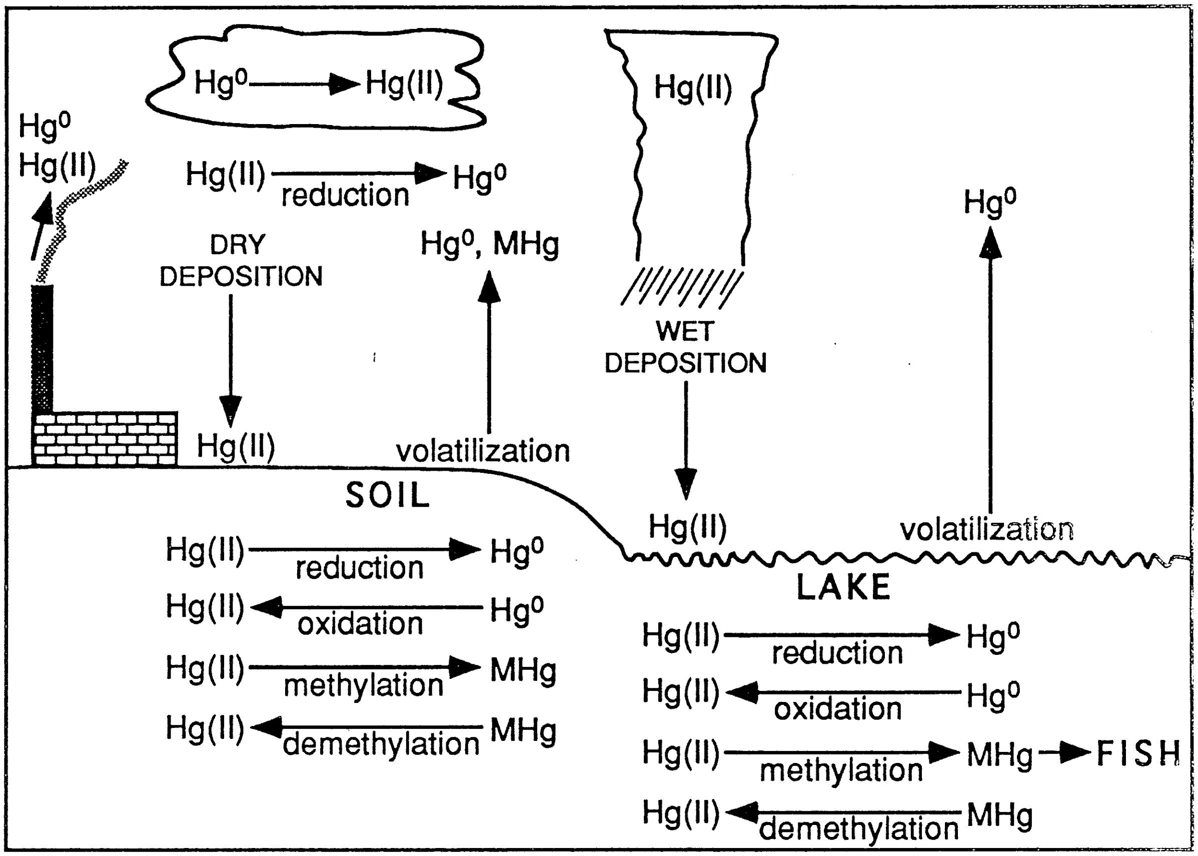
Mercury does not always take the same chemical form, or chemical species. Mercury will behave differently in the environment depending upon what form it is in. For example elemental mercury vapor (Hg^0, "Hg zero"), because it has no charge, is not very water soluble and so does not wash out of the atmosphere readily during rainfall. Oxidized mercury (Hg(II), "Hg two"), readily washes out of the atmosphere because it is ionized. Mercury does not bioconcentrate unless it is converted to a simple organic compound, methyl mercury (CH_3Hg). Methyl mercury is volatile, and is also water soluble so that it is readily washed out of the atmosphere. Methyl mercury can be produced by so-called methylating bacteria, by chemical methylation in association with dissolved humic substances, or apparently even in the flue gases of coal-fired power plants.[2] It used to be thought that methylation occurred only in the lake ecosystem, but recent studies in Sweden and Wisconsin have found significant quantities in precipitation. The three major forms of mercury in the environment (Hg^0, Hg(II), and methyl mercury) can all be converted to each other and back

2 Personal communication between N.S. Bloom and Mr. E.B. Swain of the MPCA

again. For instance, certain types of bacteria can methylate mercury and other types can demethylate (see Figure 1). Virtually all of the mercury in fish is methyl mercury (Ref. 11), because other forms of mercury do not bioconcentrate.

Because inorganic mercury can be methylated, it is necessary to restrict the environmental release of all forms of mercury. It is well established that additions of inorganic mercury to lakes does increase the concentration of methylmercury in the fish (Refs. 12 and 13). Only a small proportion (less than 10%) (Ref. 14) of the mercury entering a lake becomes methylated, and that proportion is not constant from lake to lake. For reasons that are currently uncertain, but subject to considerable research, some lakes produce fish with higher mercury concentrations than other lakes that apparently receive similar rates of atmospheric deposition. In Minnesota, higher concentrations of mercury in fish are positively correlated with higher water color (dissolved organic compounds) and sulfate and negatively correlated with lower alkalinity, pH, and phosphorus (Refs. 15 and 16).

Figure 1



A schematic description of the mercury cycle (modified from Lindqvist & Rodhe 1985)

Despite the apparent variability in methylation rates among lakes and the resulting variability in mercury concentrations in fish, it is clear that reductions in mercury loading to a given lake will result in a corresponding decrease in the mercury concentration in fish. About 75% of the mercury in the atmosphere is anthropogenic, which leaves room for 75% reduction in fish contamination if pollution sources were eliminated. There is some evidence that some pollution sources emit a fraction (up to 15%) of their mercury as methylmercury rather than simply inorganic mercury vapor.[3] Presumably this methylmercury is bioconcentrated more efficiently than natural mercury, which must first be methylated in the environment. If this is true, then pollution may account for more than 75% of the current concentration of mercury in fish.

(i) History of the Mercury Contamination Problem in Minnesota

Mercury contamination in Minnesota was first investigated in 1969 in response to reports of fish contamination from industrial discharges to streams in Sweden and Canada. Initial attention in Minnesota was focused on rivers, which received the bulk of point-source discharges. By 1976 the contamination of fish in the Mississippi, Red, and lower St. Louis rivers was reduced by 60 percent through efforts to control mercury use and discharges (Ref. 17).

By the early 1970s researchers in Minnesota, Sweden, and elsewhere had found high mercury concentrations in fish from lakes that were unaffected by point discharges (Refs. 18 and 19). At the time it was recognized that the mercury must derive from either local geology or air pollution. By the late 1980s most researchers had concluded that mercury contamination of remote lakes must derive from mercury deposited from the atmosphere (Refs. 20, 21, 22, 23, and 24). Despite considerable research on mercury in the environment, the extent to which mercury deposition had increased from natural levels was not clear.

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3 Personal communication between N.S. Bloom and Mr. E.B. Swain of the MPCA.

Some of the most reliable information on the magnitude of the increase in mercury deposition is from the upper midwest. A study of seven lakes (four in northeastern Minnesota, one in central Minnesota, one in southwestern Minnesota, and one in northern Wisconsin) found that the annual deposition of mercury has increased 3.4-fold since 1850--from 3.7 to 12.5 micrograms per square meter (Ref. 25). The data suggest that atmospheric mercury deposition rose above background at about 1850 and then increased sharply between 1920 and 1950. There is no evidence that the rate of mercury deposition has slowed in the last decade. The 3.4-fold increase translates to an average increase of about 1.7% per year over the 140 years since 1850 (uncompounded rate). Similarly, an annual increase of 1.5% has been found in the mercury concentration in air over the Atlantic Ocean, for the period 1977 through 1990 (Ref. 26). There is evidence that the increased mercury deposition is resulting in significantly higher mercury concentrations in fish from lakes in northeastern Minnesota (Ref. 27).

The observed 3.4-fold increase in mercury deposition in the upper midwest is considerably above the 2-fold increase in mercury emissions that is thought to have occurred globally (Ref. 28), consistent with the idea that not all emitted mercury joins a global pool. The idea of regionally elevated deposition is further supported by the observation that mercury deposition appears to be higher in eastern UNITED STATES, similar to acid deposition (Ref. 29). Mercury contamination of fish, apparently from atmospheric deposition, has now been documented in Minnesota, Wisconsin (Ref. 30), Michigan (Ref. 31), and Florida (Ref. 32), and 17 other states (Ref. 33).

The seven lakes that were studied in Minnesota and Wisconsin were in remote regions, distant from any concentrated emission source such as an incinerator or coal-fired power plant. Therefore, the finding that mercury deposition was relatively constant among the sites does not address the question of local deposition near (less than 10 kilometers) emission sources. It is estimated that 10% of all mercury emitted from an emission source is deposited within 10 kilometers of a source (Ref. 34). Mercury deposited close to a source is assumed to be generally associated with particles greater than 1 micron. Mercury in the gas phase or associated with smaller particles (less than one micron) is assumed to be deposited at a distance greater than 10 kilometers from a source.

(ii) Atmospheric Transport of Mercury

The distance mercury will travel in the atmosphere before deposition is dependent on what form it is in when emitted. Little information has been collected concerning the proportion of the various mercury species emitted by different sources. Although only a small proportion of emitted mercury is thought to be associated with particulates, it is this fraction that will be deposited closest to the source. Particulates are removed both through dry deposition and through scavenging by precipitation. In general, vapor-phase mercury has the potential to be transported long distances from the source, although some species (Hg(II) and methyl mercury) are subject to wash out. Hg(II) has a tendency to become associated with particles, which enhances deposition. Elemental mercury vapor is essentially a global pollutant, because it has a long residence time in the atmosphere, on the order of 3 months to 2 years (Ref. 35). The atmospheric pool of elemental mercury is slowly deposited, mostly after conversion to Hg(II), although there is some dry deposition of elemental mercury (Refs. 36 and 37). Much of the deposited mercury is eventually re-emitted to the atmosphere (the "ping-pong" effect), given that most of the landscape is soil and soil ultimately retains only a small proportion of the mercury that has been deposited (Ref. 38).

The organic matter in soil has a high affinity for mercury, so that only 10-30% is leached out of the soil by water. However, the mercury held by the soil ultimately is revolatilized back to the atmosphere. Nater and Grigal (Ref. 39) found that forest soils in Minnesota, Wisconsin, and Michigan have retained only a small proportion of the mercury deposited from the atmosphere since deglaciation 10,000 years ago (165 years worth of deposition, or about 2% net retention). Soils are therefore a significant secondary source of mercury, as are the oceans. The primary natural source of mercury to the atmosphere is volcanic activity and volatilization from mercury-bearing minerals, such as cinnabar. There are no known cinnabar deposits in Minnesota.

The MPCA has conducted an inventory of mercury emissions in Minnesota (Exhibit 1). The total estimated anthropogenic emissions are estimated to be about 10,800 lb/year. The major sources are thought to be volatilization from painted surfaces (3,000 lb/yr, 28%), coal combustion (2,000 lb/yr, 19%), and combustion of MSW (1,500 lb/yr, 14%). There is low confidence associated with the estimate of volatilization from surfaces coated with latex paint, but this source will disappear with time given the 1991 prohibition on the addition of mercury to paint. Volatilization from soil was not included in the inventory because, although likely substantial (but unquantified), it represents a re-emission of both natural and anthropogenic deposition. Because 75% of mercury deposition is anthropogenic in Minnesota (Ref. 40), soil volatilization should be regarded as a secondary anthropogenic source that will decline when primary sources are controlled.

Although there is a fairly good understanding of how different forms of mercury are transported through the atmosphere, there is little information about the forms emitted by different emission sources. If a given source emits a higher proportion of Hg(II) than Hg^0, then the source will have a greater local impact than a source that primarily emits Hg^0. There is some evidence that combustion of municipal waste results in the preferential production of Hg(II) (Refs. 41 and 42).

(iii) Effects of Mercury Contamination on Humans and Wildlife

The exposure of humans and wildlife to mercury is almost exclusively from the consumption of methylmercury in fish. In adult mammals, methylmercury affects primarily the central nervous system. In humans, the first symptoms are complaints of paresthesia, an abnormal sensation or loss of sensation in hands, feet, and around the mouth (Ref. 43). In general, adult humans do not face a significant health risk from eating fish at levels of consumption (one meal per week). A study of Cree Indians in Quebec who were relatively high fish consumers found mild neurological changes may have been caused by methylmercury in freshwater fish (Ref. 44). Fish-induced mercury poisoning has not been documented in Minnesota. However, subtle health effects are not generally recognized as symptomatic of mercury poisoning. In addition, longterm health effects may be expressed late in life after exposure has stopped.

Prenatal life is more susceptible to brain damage from mercury than are adults. Methylmercury is believed to interfere with neuronal migration, so that high exposure can produce massive disruption of the developing brain (Refs. 45 and 46). Much of the information regarding the effects of methylmercury on humans is derived from the 1971-1972 accidental consumption in Iraq of bread prepared from wheat treated with a mercury fungicide. Over 6,000 people were admitted to hospitals and over 400 people died (Ref. 47). Studies on the effects of fish consumption have supported the Iraqi data, but suffer from small population size, so that an accurate lowest effect intake cannot be firmly established (Ref. 48). A follow-up study of the population in Iraq indicated subtle effects in prenatally exposed children at lower levels than previously thought. These effects appeared at intakes 5 to 10 times lower than intakes associated with adult effects (Ref. 49). These findings are incorporated in the fish consumption advice issued by the Minnesota Department of Health for anglers (Ref. 50).

Although humans who consume fish at unusually high rates are at risk, people can be advised to either consume different or smaller fish or to obtain fish from less contaminated sources. While environmental mercury contamination is not acceptable, at least people can alter their behavior to avoid unhealthy levels of mercury intake. Fish-consuming wildlife can not be dealt with in the same manner. Wildlife such as loon, eagle, otter, mink, kingfisher, and osprey naturally eat large quantities of fish and are consuming many environmental contaminants, including mercury. For many reasons, it is much easier to assess the health of humans than of wildlife. Therefore, it is difficult to assess the degree to which wildlife is negatively affected by mercury contamination. However, it appears that loons in Minnesota are accumulating mercury to the point that reproduction is impaired (Ref. 51). Elevated mercury has been documented in Minnesota's mink and otter populations (Ref. 52). Because mercury is a neurotoxin, it may be a particularly insidious toxin for predators, who rely on speed and coordination for food.

(iv) Environmental Mercury Contamination--Conclusions

Virtually all of the mercury in remote lakes in Minnesota is a result of atmospheric deposition. Deposition rates have increased by at least a factor of 3.4 in lakes distant from emission sources. Lakes that receive drainage from watersheds within 10 kilometers of an emission source probably receive even more mercury pollution, although enhanced local deposition has not yet been documented in Minnesota.

Increased atmospheric deposition has resulted in increased mercury concentrations in fish. Most lakes tested in Minnesota yield fish that exceed 160 ng/g (0.16 ppm), the level that results in the Minnesota Department of Health advising people to restrict consumption to one meal per week or month. There is evidence that loons, mink, and otter have elevated mercury burdens that is negatively affecting their health.

Because environmental mercury levels are demonstrably too high in Minnesota, and about three quarters of the mercury is a result of air pollution, it is necessary to take measures to reduce mercury emissions in the state. Some of these reductions will reduce deposition within the state. But, because of the tendency of mercury to be transported long distances, much of the reduction will occur outside the state. However, it is difficult to call for national or international reductions in mercury emissions if we have not first done what we can within the state.

The largest source of mercury emissions in Minnesota is estimated to be volatilization from surfaces that had been painted with latex paint before 1991 (about 28% of the total). Now that mercury is no longer added to paint, this source will decline of its own accord. The second largest source is estimated to be coal combustion (2,000 lb./yr, 19% of the total). The 1990 Clean Air Act Amendments mandate a major study of mercury emissions from coal-fired power plants, due in

1995. The study will pave the way for national initiatives to reduce emissions that result from fossil fuel combustion. The third largest source of mercury emissions in Minnesota is combustion of MSW. (1,500 lb/yr, 14% of the total) It is reasonable to reduce mercury emissions from incinerators because (a) there does not seem to be any mercury concentration at which there is no environmental impact: methylmercury in fish is directly related to mercury contamination, (b) we must therefore work to reduce mercury release at all practical control points, and (c) it is feasible to reduce mercury emissions at significant point sources such as incinerators.

(2) Organics

One source of atmospheric emissions of organic pollutants is waste combustors. Among these organic pollutants are polychlorinated-p-dioxins and polychlorinated dibenzofurans (commonly referred to as dioxins and furans, PCDD/PCDF, or simply dioxins), benzo(a)pyrene, and other known or suspected carcinogens.

The organic chemicals emitted from waste combustors that have been the subject of the most research and concern are dioxins. Dioxins actually are a family 210 different chemical compounds with very different toxicities. The dioxin family contains the compounds polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF). PCDDs and PCDFs are structurally similar compounds, and share similar physical and chemical properties. Both PCDDs and PCDFs contain the same three-ring structure: two benzene rings connected with oxygen molecules that form a third ring. Substances that belong to the same chemical family are called congeners. The term PCDD refers to a group of 75 chemical compounds, or congeners, that share the triple ring structure and a dibenzo-p-dioxin nucleus but differ in the number and location of chlorine atoms. The term PCDF refers to a group of 135 congeners that contain the same basic three ring structure but with a dibenzofuran nucleus. PCDDs and PCDFs differ in the number and location of chlorine atoms. The number of chlorine atoms in both compounds varies from one to eight.

PCDDs and PCDFs that have four or more chlorine atoms are toxic. Those PCDD/PCDF molecules with less than three chlorine atoms are not. The most toxic are those with chlorine atoms located at positions 2,3,7, and 8 of the dibenzo-p-dioxin or dibenzofuran nuclei. Figure 2 illustrates the molecules. Environmental samples contain a mixture of all of the dioxins and furans.

Within this family of compounds, initial concern focused on 2378-tetrachlorodibenzo-p-dioxin (2378-TCDD), due to its highly toxic effects. Less is known about the toxicity of the remaining congeners of the dioxin family. The concentration of the remaining congeners is often higher than the concentration of 2378-TCDD in mixtures of dioxins, thus further investigation into the toxicity of these other congeners is ongoing (Ref. 53)

Figure 2. Structure of the Dioxin/Furan Molecules

(a) Exposure to Dioxins

Dioxins are highly lipophilic (fat-loving), extremely persistent chemicals that adsorb strongly onto particles, soil and sediment and bioaccumulate in the food chain. The toxicity of dioxins is reflected in the very small quantities of the chemical that cause adverse effects. For example, concentrations of total PCDDs and PCDFs in flue gas samples are measured in units of billionths of a gram (0.00000001 g or ng) per cubic meter of air. Concentrations in water samples are measured in units of trillionths of a gram (0.000000000001 g) per liter.

Dioxin's long residence time in the environment increases the chance that aquatic and terrestrial wildlife species will inadvertently consume contaminated material and bioaccumulate dioxins. However, it is not the toxicity alone that raises concern about dioxins. Once released to the environment, dioxins are slow to degrade in air, soil, water, and sediment. A long atmospheric half-life allows dioxins to travel long distances and to settle in areas remote from a known dioxin source (Ref. 54 and 55). Dioxins tend to adsorb rather than volatilize from soils, sediments and other solids. Because the chemical is resistant to microbial degradation, dioxins can remain in the soil or sediment for a long time (Ref. 56, 57, and 58)

(b) Impacts to Human Health

Dioxins are known to cause cancer in animals in laboratory experiments. EPA therefore classified dioxin as a "probable" human carcinogen, and in 1985 assigned to the chemical the highest toxicity factor it has ever assigned to a chemical. Recent evidence supports the assignment of a probable human carcinogen: a study published in January 1991 by Fingerhut et. al. examined the mortality among about 5000 workers with occupational exposure to 2378-TCDD, the most toxic congener of the dioxin family (Ref. 59). This study noted that some workers developed chloroacne, a permanent disfiguring acne condition, which is an indication of high exposure to TCDD. The Fingerhut study also suggested that cancers of the respiratory tract and soft-tissue sarcoma may result from exposure to TCDD (Ref. 60).

EPA, in 1991, began a reassessment of the toxicity of and exposures to dioxins. EPA is reviewing the past and current research on dioxin, and is developing a biologically-based model to assess dioxin's toxicity and is rewriting its health assessment document on dioxin. A draft document containing EPA's preliminary assessment was distributed to the public in September 1992. An independent, EPA-appointed advisory panel of scientists is reviewing the information and is expected to issue a final statement concerning dioxin risks sometime in 1993.

Scientists involved in the reassessment of dioxins are speculating that at very low level exposures, adverse developmental effects of the reproductive system, suppression of the immune system and other effects are likely to occur. Moreover, data indicates that dioxin contamination levels in the general population are currently near the level expected to cause adverse health effects (Ref. 61).[4]

Human exposure to dioxins occurs via several pathways: by breathing the pollutant (inhalation), ingesting soil and dust, food, water, backyard garden produce, milk and meat products, infants consumption of mother's milk, and via skin contact (dermal absorption). Inhalation and dermal absorption are not the primary pathways of low-level exposures to dioxins. In fact, it is estimated that 98 percent of the human exposure to dioxins is through the consumption of dairy products and beef (Ref. 62). The very small doses that humans ingest in their food builds up over time, and results in a growing body burden. The current body burden in the United States of the most toxic form of dioxin, 2378 TCDD, is estimated at 7 parts per trillion (ppt). The total toxic equivalent of the current body burden of dioxins (accounting for all dioxins and furans) is 30 ppt.[5] It is at these human body burdens that scientists involved in dioxin's reassessment expect to detect the adverse effects of dioxin exposure.[6]

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4 Presentation by Dr. Linda Birnbaum of the U.S. EPA at the 3rd International Municipal Waste Combustion Conference attended by Ms. Anne Jackson of the MPCA on April 2, 1993 in Williamsburg, VA.

5 Presentation by Dr. Linda Birnbaum of the U.S. EPA at the 3rd International Municipal Waste Combustion Conference attended by Ms. Anne Jackson of the MPCA on April 2, 1993 in Williamsburg, VA.

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(c) Impacts to Wildlife

An even greater danger is seen to wildlife than to humans from exposure to dioxins. When organisms are exposed to dioxins in the water, in sediments or in food, they accumulate dioxins in their body tissues, because of dioxin's lipophilic nature.

In addition to reassessing the human health risks of TCDD, EPA is evaluating the risks on aquatic live and other wildlife. TCDD in aquatic environments can be a major contribution to overall human exposure through fish and shellfish consumption. Piscivorous fish and wildlife may be particularly at risk due to their large exposure to TCDD through the aquatic food chains (Ref. 63). Like mercury contamination, humans may be able to alter their food consumption patterns to avoid high levels of dioxins, however, wildlife is not so lucky. Because of the important role fish play as a food source to birds and mammals, there is an increased concern for assessing ecological risks (Ref. 64).

In 1988, Mehrle, et. al. (Ref. 65) examined the chronic toxicity of 2378 TCDD/F in juvenile rainbow trout. The authors stated that even the lowest dose (38 pg/l) of TCDD resulted in reduced growth and behavioral responses and that significant mortality continued to occur during the 28 day observation period after the fishes' exposure had been terminated. Mehrle concluded that TCDD are extremely toxic to trout. EPA reports lake trout sac mortality due to low concentrations of TCDD in eggs has been one of the most sensitive and ecologically-relevant endpoints identified (Ref. 66). Preliminary analyses of the bioavailability of TCDD to eggs in their waterborn state indicate that other fish, such as northern pike, are nearly as sensitive. Sensitivity also appears to vary between salmonid species and within different strains of the same species (Ref. 67).

Studies suggest that there is a relationship between the presence of organochlorine compounds in the surrounding environment and the decline in populations of fish-eating birds in the Great Lakes Basin (Ref. 68, 69, 70, 71 and 72). Since the 1940s and early 1950s, several population collapses of colonial, fish-eating birds have occurred in the Great Lakes. The population collapses have largely been attributed to reproductive failure, including severe eggshell thinning, high embryo mortality, aberrant parental behavior resulting in poor nest incubation and care of nestlings, congenital deformities in chicks of herring gulls, ring-billed gulls, common terns, caspian terns, Forster's terns, black-crowned night herons and double-crested cormorants.

To better understand the problem of what was happening to the fish-eating birds in the Great Lakes Basin, Nosek et. al. (Refs. 73 and 74) undertook a study of hen ring-neck pheasants to assess the effects of exposure of TCDD. The study results show that hen pheasants are responsive to the toxic effects of TCDD and that the lowest cumulative dose of TCDD that produces overt signs of toxicity, 10 ug/kg, also reduces egg production and egg hatchability.

Reinecke and Nash in 1984 published the results of their study of the bioaccumulation of TCDD in earthworms (Ref. 75). The earthworms exposed to soils containing 0.05 ug/g TCDD bioaccumulated up to five times the original soil concentration within 7 days. The study authors deduced that TCDD is incorporated into the earthworm body tissues as well as adhering to the external body surfaces. Earthworms are an important food source for many avian, mammalian and reptilian species.

(d) Sources of Dioxins

Dioxins are not deliberately manufactured. They are an unintentional byproduct of industrial or combustion processes. There is some evidence that dioxins may result from non-anthropogenic sources (Refs. 76 and 77). However, analytical results from dated lake and river sediment cores demonstrate that the dioxin concentrations have markedly increased since the 1940's, correlating with the expanded use of chlorinated industrial compounds (Refs. 78 and 79).

Principal environmental sources, other than incineration of wastes, include industrial processes like chemical production, paper and pulp manufacturing, metal refining and smelting, wastes from these industrial processes, automobile exhaust and fossil-fuel power plants. Private heating systems and fireplaces are also potentially significant sources of dioxins to the environment. Assessments of the quantities of dioxins that these sources emit to environment are ongoing, both nationally and in Minnesota.

The presence of dioxins in waste combustor stack emissions is believed to be a result of the combustion process. Either the dioxins are produced from related chlorinated precursors such as polychlorinated biphenols (PCB's), chlorinated phenols, or chlorinated benzenes, which are structurally related compounds, or dioxins are formed from chemically unrelated compounds such as polyvinyl chloride (PVC) or other chlorocarbons (Refs. 80 and 81).

Waste combustion has been cited as a significant environmental contributor of dioxins, and much more data exists on this source, than on the sources mentioned above. Emissions of dioxins from all types of waste combustors has been reviewed in the development of this proposed rule. From this review, a preliminary quantification of the amount of dioxin released to Minnesota's atmosphere from waste combustors was made.

Actual dioxin emissions from municipal waste combustors, industrial and medical waste combustors, and small on-site incinerators were calculated and are presented in Table 2. The development of these emissions estimates is contained in Appendix 2.

Table 2. Estimated Actual Dioxin Emissions From Minnesota Waste Combustors (Appendix 2)

	MSW L/VL	**MSW Small**	**Indus.**	**Lg. Med Waste**	**All Very Small**	**Total**
No. of Facilities	4	8	20	5	1300	**1337**
Amount of Waste combusted, 1990	940,000	236,200	33,330	8,000	130,000	**1,347,530**
Total Dioxins, grams/yr	37	231	1,228	45.6	2,300 to 23,000	**3,942 to 24,642**
Confidence of Estimate	high	high	medium	medium	medium	**medium**

Notes: MSW L/VL = Large or Very Large, as defined in federal MWC regulations.
MSW Small = municipal waste combustors at less than 250 TPD;
Indus = Industrial incinerator units estimated to be operating in Minnesota, greater than 350 lbs/hr. Lg. Med. Waste = Medical waste incinerator processing greater than 350 lbs/hr. All Very Small = All incinerators processing less than 350 lbs/hr.

All MSW incinerators in Minnesota have conducted stack testing for dioxins. The municipal waste combustors in Minnesota in the large and very large group have dioxin emission limits in their air emissions permit, or have demonstrated low dioxin emissions relative to other municipal waste combustors in the United States. Although these facilities process large quantities of waste, their contribution of dioxins to the Minnesota atmosphere is small, relative to other waste combustors, if they maintain compliance with their permit limits. Eight small municipal waste combustors, also permitted by the MPCA, process about 17 percent of the waste combusted in Minnesota, yet emit only one to 6 percent of the estimated total dioxin emissions from waste combustors. The 5 medical waste incinerator facilities combined process about half the waste of the smallest municipal waste combustor, while emitting as much (Appendix 2).

This comparison highlights the fact that the contribution to atmospheric emissions of dioxins from incinerators other than the municipal waste combustors is disproportionately high. The total emissions are represented as a range, due to uncertainties about the characterization of emissions from small commercial/institutional incinerators. However, even if emission factors are used that result in the lowest emissions from any individual waste combustor, the small industrial, medical and commercial/institutional waste combustors still contribute the most dioxin, while processing only about 10 percent of the waste combusted in waste combustors in Minnesota.

It is necessary to take steps to reduce dioxin emissions in Minnesota. Minnesota has a disproportionally high use of waste combustion, a known source of dioxin emissions for which there are practical controls. While no studies have been done on Minnesota's population, at a national and international level, scientists are concerned that the human body burden is too high. Dioxin toxicity to fish and birds has been documented in the Great Lakes area, and is of significant consequence to a state that spends a great deal of time and money to protect its hunting and fishing industries.

(3) Acid Gases

Acid gases are not considered toxic to humans at ambient concentrations usually encountered near waste combustors, but present concerns for other reasons. Acid gases aggravate the effects of some toxic pollutants. Hydrogen chloride and sulfur dioxide are capable of reacting with elemental metals, making the metals more soluble in water. The combination of metal emissions and acid gas emissions in waste combustor flue gases will result in making those metals more soluble, and thus more easily absorbed by plants and animals.

In addition, the corrosive nature of hydrogen chloride emissions result in significant damage to surrounding buildings and vegetation. Trees that are directly impacted by plumes from medical waste combustors, for example, can lose their leaves prematurely. Acid gas control therefore is an important consideration in the control of emissions from waste combustors. Under current rules, acid gases are not regulated.

(c) Ineffectiveness of Existing Rules

The MPCA enforcement staff has encountered the following problems at on-site waste combustors:

- combusting potentially hazardous wastes that are generated on-site;
- lack of operator training and understanding of the pollution associated with incinerating wastes;

- failure to maintain adequate temperatures as required in current incinerator rules (Minn. Rule pts. 7011.1202, subp. 5 or 7011.1203, subp. 6);
- failure to preheat units before adding wastes;
- frequent over-charging of wastes;
- absence of temperature monitors to maintain the temperatures required in 7011.1202 and 7011.1203;
- absence of afterburners, or not operating existing afterburners, as required in current rules (Minn. Rule pts. 7011.1202, subp. 5 or 7011.1203, subp. 6).

(Ref. 82)

These problems result in opacity standard violations, and cause high emissions of toxic air contaminants. On-site waste combustors are generally small and do not have MPCA permits.

Currently, the MPCA regulates less than 100 waste combustors through air quality permits. Current permit rules exempt incinerators that combust less than 1000 pounds per hour of waste. As a result, most incinerators in Minnesota do not have permits, and the MPCA does not have a record of their installation. The operational problems and the lack of appropriate incineration equipment have led to citizen complaints about the operation of these units. Often times, MPCA staff is not aware of the use of incinerators for waste disposal unless complaints are made, either by nearby residents, or county solid waste officers. Additionally, the MPCA and county solid waste officers have found instances of inappropriate disposal at these facilities of solvents, sludges or paint filters that could potentially be hazardous waste (Ref. 83).

Specific emissions problems are detailed in the following discussions of hospital and commercial/industrial/institutional incinerators.

(1) Hospital Incinerators

In January 1989, the MPCA conducted an incineration survey and found 142 of 161 hospitals in Minnesota were found to be operating on-site waste combustors (Ref. 84). About 20 of these waste combustors were permitted when the hospital received air emission permits for their boilers. The ability to render medical waste unrecognizable and decontaminate infectious wastes accounted for the widespread popularity of incineration for medical waste generated in Minnesota. Further, landfills were unwilling to accept infectious wastes, thus resulting in more on-site incineration.

The survey also identified 19 hospitals that were burning medical waste without the use of an afterburner in the secondary chamber of the incinerator, a violation of Minn. Rule pts. 7011.1202, subp. 5 and 7011.1203, subp 6. Hospitals were notified of the violation, and each took steps to resolve the lack of afterburners.

Following the survey, the MPCA inspected 60 hospitals. Some waste combustors were found in good condition and were run by conscientious operators. Some were in good condition but were run by poorly- or untrained operators Some were in bad shape functionally as well as operationally.

Between October, 1989, and June, 1991, the MPCA conducted a study of air and ash emissions from three medical waste incinerators, funded by the LCMR. The MPCA also conducted a waste sort on the medical waste streams to determine whether there were correlations between air and ash emissions and the content of the waste stream.

Air emissions testing was done for particulate matter, metals, dioxins, acid gases, and opacity. Continuous emissions monitoring was conducted on the stack for oxygen, carbon monoxide, and sulfur dioxide. Two of the hospitals did not meet current state particulate limits and two did not meet opacity limits. On the average, emissions of cadmium, chromium, lead, and nickel were emitted at concentrations higher than those from municipal waste combustors in Minnesota. Sulfur dioxide emissions were negligible. Ash tested non-hazardous in all cases.

These facilities have short stacks, which does not provide enough dispersion of pollutants before the stack plume reaches ground level. Short stacks, combined with the high concentrations of pollutants in the flue gas stream cause high concentrations of pollutants in the ambient air. As a result of computer dispersion modeling conducted by the MPCA, the three hospitals exceeded MPCA air toxics guidelines for acceptable ambient air concentrations of chromium and dioxins (Ref. 85).

Air emissions from medical waste combustors vary widely. Emission quantities depend on the composition of the waste stream, the combustor design, the operating conditions of the combustor, and the air pollution control equipment in use. Compared to municipal waste combustors, medical waste combustors do not emit unique pollutants, however, emissions of certain pollutants can be higher. For example, on a per-ton-of-waste-combusted basis, emissions of mercury and dioxins can be higher from medical waste combustors than from municipal waste combustors (Ref. 86).

In order to reduce mercury and dioxin emissions in Minnesota, hospital waste incinerators require rules that mandate better combustion equipment and efforts to remove mercury from the waste and air emissions be used.

(2) Commercial/Industrial/Institutional Waste Combustors

Another group of on-site incinerators in wide use in Minnesota is those at groceries, commercial and wholesale businesses, institutional users, and manufacturing businesses. These waste combustors are also currently unpermitted.

Much of the waste handled by grocery store and commercial/retail business waste combustors comes from packaging--cardboard boxes, shrink-wrap, packing filler and strapping (Ref. 87). These waste combustors also are used for incinerating products and merchandise that is outdated or is damaged, so that these items cannot be scavenged from the waste stream and resold.

Institutional users include schools and churches. These combustors are used for reducing the amount of waste sent for land filling. The waste stream typically consists of paper, kitchen wastes (styrofoam plates, milk cartons, food wastes) and miscellaneous items (spray cans, rags, etc.)

Some industrial facilities have waste streams that represent viable fuel sources, and so are combusted to recover usable heat. Paper mills and wood processing plants produce by-products such as sludges, wood waste, trimmings, and the like that have a relatively high heat value. Agricultural processing facilities end up with residues, pallets and trimmings that could potentially be used as a fuel. Industries involved in printing have ink sludges and roll ends that are combustible. These wastes are used as a fuel primarily for the generation of heat or steam to be used to supplement overall steam generation.

Some industrial waste incinerators are used for volume reduction, in order to salvage non combustible materials from the wastes. Examples of these type of incinerators include wire incinerators (to recover copper from insulated wire), and circuit board incineration (for recovery of semiprecious and precious metals from the circuits).

Emissions from wire and circuit board incinerators depend on the materials being combusted. Generally, wire incinerators emit very high quantities of particulate matter, due to the composition of the insulation being incinerated. Accompanying the particulate matter emissions are high emissions of sulfur dioxides, and if combustion conditions are not optimal, combustion will not be complete and will generate unacceptably high amounts of organic emissions (Ref. 88).

Current information regarding combustion technology and environmental impacts show that the existing state rules are inadequate to minimize emissions from waste combustors. For example, it is known that waste combustion is a significant source of dioxins to the environment, and that significant control is achieved through good combustion practices. The existing rules do not require design and operation parameters that reflect good combustion practices, such as high enough combustion temperatures, trained operators, monitoring of furnace and pollution control device temperatures and routine testing of stack emissions to verify waste combustor performance. Waste combustion is also a source of a wide range of toxic metals, but current standards of performance do not adequately control metals.

The MPCA has documented that at these small incinerators, little attention is paid to operation or maintenance of the incinerators. Waste stream contents are not monitored for inappropriate materials like aerosol cans and non combustibles, or wastes that must be separately handled as hazardous waste. Grocery stores and other commercial waste generators are incinerating cardboard boxes, even when it is marketable as a recyclable material. Little attention has been given to reducing waste or developing alternative means of disposal.

The 1984 Waste Management Act amendments directed that the MPCA "...shall promote solid waste disposal control by encouraging the updating of collection systems, elimination of open dumps, and improvements in incineration practices." Minn. Stat. § 116.07, subd. 2 (1992).

This rule making is needed to insure that all types of waste combustors install appropriate air pollution control and monitoring equipment to reduce the amount of toxic air emissions, that waste streams are evaluated so that combustors are properly sized and matched to the waste, and that combustors are operated in a manner that minimizes air pollutant emissions. There is need to revise the air quality rules regulating waste combustors to include standards, design and operating conditions, and reporting requirements for all waste combustors to reduce their air emissions.

B. THE NEED TO INCORPORATE STATUTORY REQUIREMENTS FOR WASTE COMBUSTOR PERMIT DEVELOPMENT AND MONITORING

The Minnesota Legislature establishes statewide policy concerning the management of solid waste. Some of those policies are implemented by the MPCA and require rulemaking. This statement of need describes the statutory requirements that the proposed rule addresses.

In response to growing concerns about the impact of land filling solid wastes, along with concerns about solid and hazardous waste management in general, the Minnesota Legislature enacted the Waste Management Act of 1980. Minn. Stat. Chap. 115A. The Legislature established the state's goals for solid and hazardous waste management. The goals of the Act were amended in 1991, and now state:

> (a) it is the goal of this chapter to improve waste management in the state to serve the following purposes:
>
> (1) Reduction in waste generated;
> (2) Separation and recovery of materials and energy from waste;
> (3) Reduction in indiscriminate dependence on disposal of waste;
> (4) Coordination of solid waste management among political subdivisions; and
> (5) Orderly and deliberate development and financial security of waste facilities including disposal facilities.
>
> (b) The waste management goal of the state is to foster an integrated waste management system in a manner appropriate to the characteristics of the waste stream. The following waste management practices are in order of preference:
>
> (1) waste reduction and reuse;
> (2) waste recycling and yard waste composting;
> (3) resource recovery through mixed MSW composting or incineration; and
> (4) land disposal.
>
> Minn. Stat. § 115A.02 (1992)

This declaration makes it clear that the Legislature regards land disposal as the least favored waste management option.

The 1984 Waste Management Act amendments directed the MPCA to "...promote solid waste disposal control by encouraging the updating of collection system, elimination of open dumps, and improvements in incineration practices". Minn. Stat. § 116.07, subd. 2 (1992). The 1984 amendments also included close supervision of landfill use outside the metropolitan area. The amendments require the Office of Waste Management (OWM) to issue a certificate of need before further landfill expansions are permitted. A certificate of need will not be issued until the county for which new capacity is sought has an approved solid waste management plan. The certificate will validate only the capacity for which there is no feasible and prudent disposal alternative.

The focus of the solid waste management plans is to reduce the reliance on land filling, giving priority to waste reduction, separation and recycling. Minn. Stat. § 115A.46, subd. 2(b) (1992). The waste management plans must describe all aspects of waste management, including opportunities for improvements in the system. The plans are required to evaluate the most feasible and prudent reduction of the need for and practice of land disposal of mixed MSW.

Many counties responded to these legislative policies and requirements to eliminate or reduce the amount of waste landslide by investigating incineration as part of the management programs for MSW.

In addition to discouraging landfilling, the Legislature has also regulated aspects of waste incineration, particularly lead, dioxin and mercury emissions. The Minnesota Legislature during the 1989 session began considering statutory limits on the amount of mercury in batteries, the largest contributor of mercury to the municipal waste stream (Ref. 89). Through discussions about the disposal of batteries, particularly when they are incinerated, the Legislature learned that if a waste combustor exceeded mercury emission limits contained in the waste combustor's permit, the MPCA did not have authority to halt combustor operations to make repairs.

As a result, in 1989, the Legislature enacted a statute requiring continuous emissions monitoring of waste combustors. Minn. Stat. § 116.85 (1992). This statute requires that if an air emissions permit contains metals or dioxin emissions limitations, then continuous monitoring of the stack emissions is required. Further, if there are exceedances of the emission limitations, and the cause of the exceedance cannot be remedied within 72 hours, the facility must cease operation until the exceedance has been resolved.

In 1989, the Legislature also enacted two other statutes that affect the permitting of waste combustors. Minn. Stat. § 116.07, subd 4j prohibits the MPCA from issuing permits for new or additional capacity for a municipal waste combustor unless the counties using the facility have a solid waste management plan approved by the Office of Waste Management (for the 80 nonmetropolitan counties) or the Metropolitan Council (for the seven county metropolitan area). The permits must reflect the capacities approved under those solid waste management plans. Further, this statute requires a permit applicant for any waste combustor to submit an ash management plan with the permit application. Minn. Stat. § 116.07, subd. 4j (1992).

The Legislature also passed a measure that affects waste combustor permitting as it relates to ash management. Minn. Stat. § 115A.97 requires that mixed MSW incinerators be planned and managed to reduce the toxicity of ash, the amount of ash generated, and the amount of waste processing residuals that require disposal. Minn. Stat. § 115A.97, subd. 1 (1992). The statute also requires that an application for a permit to build a municipal waste combustor show how the applicant will achieve these goals. Applications for reissuance of operating permits must also address achievement of these goals. Minn. Stat. § 115A.97, subd. 6(1992).

The Minnesota Legislature in the 1989 Special Session enacted legislation for the combustion of RDF in solid fuel boilers until EPA or the MPCA develop rules regulating emissions from this type of activity, or until June 1991. In 1991, the Legislature modified this provision and exempted boilers combusting RDF from regulation as a waste combustor if the boiler combusts less than 30 percent by weight of RDF. Minn. Stat. § 116.90 (1992). In the 1992 session, the Legislature again modified this language to expand requirements for combusting RDF.

Finally in 1990, the Legislature amended Minn. Stat. § 116.85 to address certain permit exceedances. The provision requires that should periodically monitored emissions, like mercury, exceed emission limitations of a permit, the commissioner of the MPCA shall direct the facility to make appropriate modifications to meet the permit limit within 30 days, or to conduct appropriate testing for a maximum of 30 days to insure compliance. If compliance is not achieved within 30 days, the combustor must cease operation until compliance is demonstrated with additional testing. Minn. Stat. § 116.85, Subd. 3 (1992).

The proposed rules are needed to integrate the legislative mandates into the general waste management scheme and to establish consistent enforceable procedures for meeting the legislative directives. The proposed rules will complement the solid waste rules to provide MSW managers with complete permitting requirements for waste combustors, including requirements to apply for a permit, waste combustor standards of performance, and ongoing operation, maintenance, and training requirements of an owner or operator. These requirements will allow solid waste managers to compare disposal and handling alternatives for solid waste management, and will provide sufficient information so that the MPCA can assess the facility's potential impacts on human health and the environment.

C. INCORPORATE FEDERAL EMISSION GUIDELINES AND REGULATIONS FOR EXISTING AND NEW MUNICIPAL WASTE COMBUSTORS

In the July 7, 1987, Federal Register, EPA published a public notice entitled "Assessment of Municipal Waste Combustor Emissions under the Clean Air Act." 52 Fed. Reg. 25399 (1987).

The EPA estimated the risk of exposure via inhalation to the toxic emissions from MWCs. Nationally, the incidence of cancer from exposure to emissions from MWC's was estimated to be in the range of one in a million to one in ten thousand (or 1E-6 to 1E-4) for the maximally exposed individual. This risk can also be expressed as from one additional occurrence of cancer in one million people to one additional occurrence of cancer in ten thousand people above the natural incidence of cancer in humans.

As a general policy in developing regulations concerning toxics, EPA aims to regulate environmental activities such that the estimated risk for an activity is one in one million (1E-6). Therefore, EPA determined that additional regulation of emissions from municipal waste combustors was necessary.

The notice stated that it was advance notice of EPA's intent to propose regulation of MWC emissions from new or modified MWC's under Section 111(b) of the Clean Air Act (CAA). This means EPA intends to develop new source performance standards (NSPS) for new MWCs.. The notice announced further that EPA would issue guidelines for controlling air emissions from existing MWC's, as provided under Section 111(d) of the CAA, to be followed by the States' development of specific emission standards for existing MWC's. Finally, the notice announced that EPA anticipated public-noticing a draft municipal waste combustor NSPS in November of 1989.

The EPA published proposed emissions guidelines for all existing facilities and new source performance standards (NSPS) for new facilities on December 20, 1989. 54 Fed. Reg. 52209

(1989) and 54 Fed. Reg. 52251 (1989). The affected facilities are municipal waste combustors, which are defined as "...any device that combusts MSW including, but not limited to, field-erected incinerators (with or without heat recovery), modular incinerators (starved air or excess air), boilers (i.e., steam generating units), and furnaces (whether suspension-fired, grate-fired, mass-fired, or fluidized bed-fired)." Municipal solid waste is defined as "...refuse, more than 50 percent of which is waste consisting of a mixture of paper, wood, yard wastes, food wastes, plastics, leather, rubber, and other combustible materials, and noncombustible materials such as metal, glass, and rock. RDF is considered to be MSW. Construction/demolition waste is not considered to be MSW." EPA proposed applying the standards to all sizes of waste combustors.

On February 11, 1991, after considering comments received on the proposed regulations, EPA published final NSPS for new municipal waste combustors and emission guidelines to the states for existing municipal waste combustors. 56 Fed. Reg. 5507, 5523, February 11, 1991 (Appendix 3). The intended effect of the promulgated standards is to require new, modified, and reconstructed municipal waste combustors to control emissions to the level achievable by the best demonstrated system of continuous emissions reduction, considering costs, nonair quality health and environmental impacts and energy requirements. Emission guidelines are to be used by state agencies to develop regulations for controlling emissions from existing facilities.

The United States Congress in 1990 passed amendments to the Clean Air Act, which were signed by President George Bush in November 1990. The Clean Air Act (CAA) amendments contain provisions to deal with many air emission sources. Section 129, Solid Waste Incineration, requires EPA to develop requirements for the control of air emissions from all types of solid waste combustion facilities (Appendix 4).

The Clean Air Act amendments require that within 12 months of passage (November 1992), EPA shall promulgate new source performance standards for new waste combustion units with a capacity of greater than 250 tons per day of MSW, and that EPA shall also promulgate emission guidelines for existing facilities of this size.

The Act requires that within 24 months of passage, EPA shall promulgate standards for new waste combustion units with a capacity less than 250 tons per day of MSW, and hospital/medical/infectious waste combustors, and that EPA shall also promulgate emission guidelines for similar existing facilities.

The Act requires that within 36 months of passage, EPA shall propose standards for new commercial and industrial waste combustion units. These standards shall be promulgated within 48 months.

As stated in part 1 above, EPA has, in part, met the first deadline established in the 1990 Clean Air Act amendments. The EPA promulgated the NSPS for new municipal waste combustor units with a capacity of 250 tons per day on February 11, 1991. The EPA also published emission guidelines for existing MWC units with capacities that are greater than 250 tons per day. Under the Clean Air Act requirements, EPA stills needs to propose mercury, lead and cadmium emission limitations for these facilities, and to meet the second and third deadlines.

The MPCA is required to establish requirements and standards at least equal to the federal NSPS and emission guidelines for municipal waste combustion units with a capacity of greater than 250 tons per day in order to receive authority from EPA to administer the federal air quality program. To receive this authorization, the MPCA must incorporate the federal requirements and standards into the MPCA rules and then submit the adopted rules to the EPA as part of the State's plan implementing the NSPS and emission guidelines.

Emission limits for particulate matter, dioxins, carbon monoxide, and nitrogen oxides must be added to the existing Minnesota incinerator rules for new and existing MWCs greater than 250 TPD in order to meet the minimum requirements for receiving EPA approval of Minnesota's plan implementing federal regulations. The rules must also require proper continuous emission monitoring systems, annual stack testing and operator training and certification. The existing rules do not contain any of these operating requirements. The specific requirements of the federal regulations are described in detail in the applicable portions of the statement of reasonableness.

Although the 1990 Clean Air Act amendments require that EPA develop regulations for all types of waste combustors by November, 1994, the Act does not prohibit states from upgrading their regulations sooner. Enough is known now to place minimum requirements on all types of waste combustors either operating or proposed to be constructed in Minnesota. The principals of combustion are the same regardless of the type of waste being burned, and requirements and standards of performance can be established at this time. Under the federal rule making schedule, eight of the 12 operating MWCs in Minnesota and 30 existing medical waste combustors would not be regulated for at least another year. Over 1300 commercial/institutional/industrial waste combustors would not be regulated for at least three more years.

Further, the MPCA is concerned that the EPA will be unable to meet the time schedule set out in the Clean Air Act amendments for waste combustors. The Clean Air Act amendments are massive. Many of the other titles and requirements are as high a priority for EPA as the promulgation of waste combustor regulations and guidance. Therefore, the MPCA believes it is necessary to continue the process of revising the existing incinerator rules for all types of waste combustors.

Because EPA rule making for waste combustors will come after the MPCA's rule making, the MPCA may need to further revise the proposed rules to maintain equivalency with the federal requirements and standards.

D. CONCLUSION

Both the Minnesota Legislature and EPA have waste combustor requirements in place that the MPCA must implement. Apart from state and federal mandates, the environmental impacts from waste combustor impacts is real. Metals and organic emissions pose a threat to human health and the environment because of their ability to bioaccumulate and bioconcentrate in the environment. The proposed rules are necessary to mitigate these impacts.

IV. STATEMENT OF REASONABLENESS

The MPCA is required to make an affirmative presentation of the facts establishing the reasonableness of the proposed rules. Minn. Stat. §§ 14.131 and 14.14, subd. 2 (1992). Reasonableness is the opposite of arbitrariness and capriciousness and means that there is a rational basis for the MPCA's proposed rules. This section will discuss the reasonableness of the proposed rule as a whole, and then the reasonableness of each part of the proposed rule.

A. REASONABLENESS OF THE RULES AS A WHOLE

As stated in the Statement of Need, this rule is proposed to satisfy three general needs: 1) to implement federal standards and guidelines, 2) to bring together various requirements in Minnesota Statutes and rules that impact waste combustors, and 3) to reduce emissions from waste combustors of all sizes. The primary focus of the Statement of Reasonableness is on portions of the proposed rule which go beyond requirements that are mandated by the federal standards and guidelines or Minnesota Statutes.

The federal standards and guidelines dictated many aspects of the proposed rule. For example, the federal standards and guidelines define and regulate three classes of waste combustors: new municipal waste combustor units with a capacity of 250 tons per day or more; existing very large municipal waste combustor plants with an aggregate capacity of greater than 1,100 tons per day; and existing large municipal waste combustor plants with an aggregate capacity from all individual units of 250 or more, and less than 1,100 tons per day. These classes of waste combustors correspond with the proposed waste combustor Classes I, A, and B respectively. The proposed requirements for waste combustor Classes I, A, and B are the result of the federal standards and guidelines. The proposed rule must be (and is) at least as strict as the applicable federal standards and guidelines. For Classes I, A, and B, the proposed rule adopts the federal standards and guidelines with two exceptions where it is more stringent: mercury and dual particulate matter (front-half and total PM) emission limits are proposed.

The proposed rule also includes provisions that are exclusively required by Minnesota Statutes such as the requirement to shut down the waste combustor when an exceedance of an emission limit is indicated by data from stack testing or continuous monitoring and the unit cannot be returned to compliance within a specified period of time. For a complete discussion of these requirements, see the discussion of the reasonableness of the requirements for continuous monitoring and performance testing at IV. C. 14. and IV. C. 15. of this SONAR.

There are also other Minnesota Rules that affect waste combustors. For example, municipal waste combustors are significant components of solid waste management plans for several counties in Minnesota. As solid waste management facilities, municipal waste combustors are also required to comply with certain solid waste rules. Since it may not be clear to all MWC operators that some solid waste rules apply, the applicable solid waste rules are referenced in the proposed rule, where appropriate.

The MPCA has a considerable amount of discretion in proposing this rule. As stated, the recently promulgated federal standards and guidelines apply only to waste combustor Classes A, B, and I. Code of Federal Regulations title 40, subpart E also applies to smaller waste combustors, but current Minnesota rules meet the requirements of subpart E. At the discretion of the MPCA, many of the requirements set forth in the federal standards and guidelines have been extended to smaller waste combustors and modified to account for the smaller size and more limited resources available to these waste combustor owners and operators.

Although the MPCA is not required to regulate small waste combustors, it was decided to regulate all waste combustors in Minnesota to satisfy the need to minimize emissions from waste combustors. Solid waste management costs have risen in Minnesota due to a number of state agency and Legislative efforts to upgrade and overhaul the solid waste management system in Minnesota. In response to those increases, many solid waste generators (including homeowners, businesses, cities, and counties) have considered the use of incineration to, in part, reduce the volume and weight of waste must that be disposed. The MPCA chose to regulate small incinerators in order to ensure that future use of on-site incineration is done properly to minimize emissions from waste combustors. Further, because the on-site incinerators were generally unregulated in the past, the MPCA has also chosen to regulate existing incinerators in this rule making. See the Statement of Need for a discussion of the need to reduce emissions from all classes of waste combustors.

In preparing the proposed rule, many factors were considered and input was solicited from interested parties including a technical advisory committee. A Waste Incineration Technical Advisory Committee (WITAC) was formed by the MPCA, and first convened in March 1988. The WITAC membership consisted of the waste combustor industry, consulting engineers, environmental group representatives, healthcare facility representatives, Minnesota county representatives, private citizens, and MPCA and Office of Waste Management staff. Approximately 12 technical advisory committee meetings were held. Separate mailings were also sent to the WITAC for comments on technical work papers.

Further, a number of issues were also discussed at 16 MPCA Board Air Quality and/or Ground Water and Solid Waste Committee meetings, from March 1989 to the present. These meetings were held so that MPCA Board members and any interested member of the general public could address various issues that arose during the drafting of the proposed rule. Notice of the meetings was sent to all persons on the MPCA list of persons interested in this rulemaking.

Key factors considered in preparing the proposed rule are:

environmental benefit;
cost to the waste combustor owner or operator;
economic impact on the waste combustor owner or operator or the community in which the waste combustor is located;
consequences of no action;
technical and administrative feasibility; and
impact on waste management plans.

These factors were carefully considered when proposing the following key rule elements:

mercury emission limit that would probably require add-on mercury control for waste combustor Classes A, B, I, and II;
mercury emission limit that would probably not require add-on mercury control for Class C waste combustors;
no mercury emission limit for waste combustor Classes D, III and IV.
no acid gas emission limit for waste combustor Classes C, D, III, and IV.
ban most Class IV waste combustors;
operator training and certification; and
minimum stack height requirements for small incinerators.

For discussion on the reasonableness of these or any other requirements of the proposed rule, see the corresponding section of the Statement of Need and Reasonableness.

In summary, the proposed rule satisfies, to the greatest extent possible, the needs as discussed in the Statement of Need without imposing unnecessary or unreasonable costs or burdens on the owners or operators of waste combustors or the residents of Minnesota. The results of the proposed rule will be a cleaner environment and an effective method of disposing of solid waste.

B. REASONABLENESS OF PROPOSED AMENDMENTS TO MINN. RULES CHAPTER 7007

1. Part 7007.0200 Sources Required or Allowed to Obtain a Part 70 Permit

Subpart 4. This discussion addresses the reasonableness of the proposal to amend the operating permit rule to identify which waste combustors are required to obtain a "Part 70" operating permit.

The MPCA published public notice of the proposed adoption of the operating permit rule on June 3, 1993 (17 SR 3008, June 3, 1993). The operating permit rule revises Minnesota's air emission permit application and issuance procedures in order to comply with the requirements of the Clean Air Act. The anticipated adoption date of the operating permit rule is October 26, 1993.

The Clean Air Act, Section 129(e)(1) requires operating permits under 40 CFR 70 for all sources for which standards of performance have been promulgated under the authorities of that section.. EPA's Operating Permit regulations (40 CFR Part 70) require Part 70 permits for major sources of air pollutants. This subpart repeats these requirements in order to clarify their application to waste combustors.

2. Part 7007.0250 Sources Required to Obtain a State Permit

Subpart 5. This discussion addresses the reasonableness of the proposal to amend the operating permit rule to identify which waste combustors are required to obtain a state permit. The MPCA has the authority to issue permits for the emission of air contaminants or for installation of an emission facility. Minn. Stat. § 116.07, subd. 4(a) (1992). Proposed Minnesota rules Part 7007.0250 establishes when it is necessary to obtain a "state permit". This subpart proposes to require a state permit for all waste combustors, with an exception as discussed in the next paragraph. Permits are used to specify and regulate conditions that are specific to the facility. Some conditions are not common to all facilities and therefore cannot be included in the promulgated rules that apply to all facilities. In addition, it is likely that EPA will adopt regulations that will require these sources to obtain part 70 permits in the future. It is reasonable to require waste combustors that are not required to obtain a Part 70 operating permit to obtain a state operating permit to regulate site-specific conditions. "State permits" are non expiring by default but may be issued for limited terms under certain conditions (see proposed chapter 7007.1050).

The proposed exception to the state operating permit requirement is Class IV waste combustors that are operated at hospitals or forensic science laboratories, but are not required to obtain a permit. Owners and operators of these waste combustors will be required to notify the MPCA of the existence of the incinerator and to comply with the proposed standards of performance. The proposed rule limits these facilities to a level of sophistication at which facility-specific conditions are not necessary. These waste combustors do not have post combustion pollution control equipment. They also have much less sophisticated combustion controls than other waste combustor classes. The absence of post combustion pollution control equipment and sophisticated combustion control equipment means that rules applicable to the entire class are as effective in controlling emissions as a permit is for controlling emissions from a more complex facility. For this reason, it is reasonable to require notification in lieu of an operating permit for hospital waste combustors and forensic science laboratory waste combustors.

Comments have been received regarding the siting a of hospital waste combustor without community participation in the MPCA's permitting process. Minnesota statutes allows local units of government to establish permitting procedures and emission standards for waste combustors.

Minn. Stat. § 116.07, Subd. 4. states in part:

> As to any matters subject to this chapter, local units of government may set emission regulations with respect to stationary sources which are more stringent than those set by the pollution control agency.

Local units of government through ordinances can require permitting, thus letting the community use the permitting process to decide whether hospitals should be allowed to operate waste combustors in their community. Local units of government have zoning authority which also affects siting of waste combustors and allows public input. Further, installation of waste combustors requires a number of building permits and inspections by local regulating departments and agencies, meaning that communities are notified through a number of avenues of a waste combustor installation. Because a state permit is not necessary, an alternative to the MPCA's permitting process are available to persons who object to the siting of waste combustors in their community and the proposed rule still regulates the operation of these units and limits emissions from them, it is not unreasonable to require notification in lieu of an operating permit for hospital waste combustors.

An additional group of waste combustors are proposed for regulation rather than permitting in this rule making without a permit. Class IV waste combustors that are crematories, pathological waste combustors, or combust solely animal carcasses are exempt from the conditions of the rule, and have separate standards of performance applied to them. These waste combustors are proposed to be regulated not because they emit dangerous pollutants but, because if they are improperly operated, they become a nuisance to their neighbors. Separate standards of performance have been developed for these facilities because these facilities' emissions will be negligible if they adhere to the proposed standards of performance. The standards of performance reflect current incineration industry standards, and are straightforward. For these reasons, it is reasonable to exempt Class IV crematories, pathological waste combustors and animal carcass incinerators from all permit requirements.

3. Reasonableness Of Part 7007.0501--Additional Contents Required In A Permit Application For A Class I, II, III, B, C Or D Waste Combustor

This new part sets forth the information an applicant for a waste combustor permit is required to submit to the MPCA. This rule supplements the general permit application requirements in Minn. Rules pt. 7007.0500, Content of a Permit Application with additional requirements for waste combustor applicants.

The proposed rule provides project proposers with clear requirements for information that must be generated for the MPCA to determine which standards of performance are applicable to a facility, and to specify operating limitations for the waste combustor if necessary. The information is needed to develop detailed, site-specific conditions for each waste combustor.

Permit development is a highly resource-intensive activity, both for the MPCA staff and the waste combustor owner. Air Quality permits are issued for the installation and operation of specific pieces of equipment. To draft the rules, the MPCA staff considered what information it has routinely requested of permit applicants for waste combustors in developing the current waste combustor permits. The proposed rules identify those pieces of information that the MPCA has learned are necessary to evaluate a permit application and to develop operating, monitoring and reporting permit conditions tailored specifically to the facility. Additionally, federal new source performance standards and emission guidelines for municipal waste combustors require that certain information be submitted to determine compliance with federal standards. If this information is submitted to the MPCA in a clear, straight-forward format, the permit development process is smoother.

a. **Subpart 1. Additional Requirements.** This subpart states that the information required by the proposed rules is in addition to information requirements for air emission permit applications. It is reasonable to state this to avoid repetitive drafting of requirements that appear in other rules, and to inform permit applicants of other information that must be included in their permit application.

b. **Subpart 2. Information Required.** This subpart describes the additional information that must be included in a waste combustor air emission permit application.

Item A. Item A of subp. 2 requires that a permit application for Classes A, B, C, D, I , II and III waste combustors include a waste composition study. A waste composition study provides information for selecting waste processing components, and for supplying information about the success or failure of waste content management methods. The information generated assists the MPCA in predicting the general composition of air emissions and in determining whether the proposed facility is suitable for the waste to be combusted..

The proposed rules require a waste composition study to be conducted and submitted with an application for both a new permit and for permit reissuance, because the composition of waste burned in a waste combustor can change in the five years between MPCA permit review of the facility. Waste combustor Classes II, III, C, and D will be issued state permits that do not expire and therefore, will be required to submit a current waste composition study every five years under the performance test schedule section of the proposed rule (part 7011.1270).

Characterization of the fuel is required to design any combustion facility. Knowing the make-up of the fuel allows the designer to predict the quantities of gas generated, and thus to properly size combustion chambers, blowers, fans, air pollution control equipment, and stacks. For example, when coal-fired boilers are designed, a specific coal is selected. The use of off-specification coals can result in serious performance losses, such as loss of steam generating capacity, tube fouling, furnace corrosion, and excessive air emissions.

These same design concerns also apply to waste combustors. Varying fuel values or a high percentage of specific wastes would require appropriate combustion and control equipment to combust the specific waste stream over a wide range of waste conditions while minimizing air emissions. The characteristics of the solid waste stream must be determined first, then the combustor must be designed to perform properly when combusting that waste stream. The waste stream information required under this rule is generated when the applicant selects combustion equipment.

A recent study of the performance of hospital waste combustors concluded that while performance-related problems and emission exceedance problems can be caused by poor equipment design, waste combustor performance problems and emission exceedances are more often caused by improper waste characterization, waste quantification or waste management practices. The study concluded that accurate waste stream analysis prior to incinerator design is "imperative to avoidance of waste-related operational problems" (Ref. 90).

The necessity of a periodic waste composition study was demonstrated by the MPCA when it conducted an extensive waste composition study on MSW throughout Minnesota. The Legislative Commission on Minnesota Resources (LCMR)-funded project was conducted in order to characterize the content of mixed MSW through the year. Sorts were conducted in the summer and fall of 1990, and the winter and spring of 1991 in outstate Minnesota. Sorting was conducted in the Twin Cities metropolitan area starting in August, 1991 through November, 1992.

The outstate MSW composition study was conducted at five landfills/transfer stations. In the Twin Cities, sorting was conducted at five additional facilities, which included two RDF processing facilities, a landfill, a transfer station, and a municipal waste combustor.

The study concluded that waste composition is expected to change rapidly because of various forces acting in Minnesota. Waste designation, economics of recycling various materials, legislation for new waste management incentives, and facility closings will all effect the composition of the waste stream.[7]

In order to begin characterizing a waste stream, a systematic approach to sampling is necessary. Item A requires the use of sampling methods prescribed in the EPA-developed guidance "Test Methods for Evaluating Solid Wastes" or other equivalent testing procedures, approved by the MPCA commissioner, to sample the wastes proposed for incineration. It is reasonable to standardize sampling methods so that results have meaning for all of the waste combustors. The EPA document is available via the MPCA, EPA, or technical libraries, and is a standard reference document for hazardous and solid waste management.

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7 Conversation between Ms. Susan Mitchel of the MPCA and Ms. Anne Jackson of the MPCA.

Several commentors, during the drafting of the rule, suggested that waste composition studies are needless, or too difficult to conduct to produce meaningful data. The concerns included the difficulties in getting representative sampling of the waste stream, due to the sometimes vast array of items that make up the waste stream. Owners and operators of very small incinerators have expressed concern that they do not have the technical expertise, or the financial resources to conduct the waste stream analysis that the proposed rule requires.

The commentors concerns may be overstated. To generate data that will accurately represent waste streams requires reproducible sampling and analysis procedures and routine sampling. Sampling using the specified methods and analysis using ASTM methods will result in useful, reproducible and meaningful information.

As a result of the MPCA's waste composition study, there is a cadre of knowledgeable solid waste experts who are quite experienced at waste sorting, and have the ability to conduct these waste sorts. Waste facility owners can arrange to conduct the waste sort themselves, hire sorters that participated in the MPCA's waste sort effort, or hire an environmental consultant.

The utility of the information is high. An applicant cannot demonstrate that a waste combustion system or a modification to the system is appropriate or adequate to burn waste within emission limits without knowing the composition of the waste. The MPCA cannot issue a permit approving a specific waste combustor design to burn a given waste stream without knowing whether the proposed design is suitable to the waste stream. The waste composition study will provide the waste stream information that is necessary to make the decisions.

Two additional reasons for a waste composition study are problem materials in medical waste and the rule requirement to develop a waste management plan. Problem materials in medical waste streams make the understanding of the waste stream even more important. A medical waste composition study will help identify alternative means of controlling the problem materials in medical waste, like PVC plastics, mercury batteries, and pathological wastes.

Under this rule, certain waste combustor owners and operators must develop a waste management plan to separate wastes which contain mercury for alternative means of disposal. Separating wastes which contain mercury was chosen over requiring equipment to reduce mercury emissions for certain facilities, because the facilities are too small to justify the considerable expense of mercury control equipment..

Mercury is known to be contained in specific components of the waste stream, like batteries and lightbulbs. Mercury is also a trace contaminant in larger fractions of waste, like wood and paper. In order to develop a mercury separation plan, a waste composition analysis is necessary to first identify how much of each type of waste is in the waste stream, and second, to determine whether the separation of that waste would result in reductions of mercury emissions.

The waste composition study has four parts:

1. a fractional analysis
2. a proximate analysis
3. an ultimate analysis
4. a heat value analysis

Item A. 1. Subitem 1 of Item A requires a fractional analysis of the waste stream. The permit applicant must identify by weight the percent of combustible and noncombustible wastes, as well as conduct a waste sort that identifies the percent by weight of paper, cardboard, plastic, metals, wastes that contain mercury, glass, organics and inorganics. This list includes the general categories of waste present in most commercial and residential solid waste streams. The sort must also identify recyclable and problem materials.

An applicant must conduct a fractional analysis when selecting its combustion system. Both physical characteristics and chemical composition of the waste affect selection of the incinerator system components. Quantity and waste item size are major factors in deciding what type of combustion system to use (Ref. 91). A fractional analysis determines the percentage of combustible and non-combustible material. Knowing the amount and size of noncombustible materials in the waste stream will help size the ash-handling systems. For example, the ash-handling systems must be sized to accept not only the total quantity of noncombustibles, but must also handle the largest expected item of waste. If an oversized item happens to get into the waste combustor, then the incinerator would have to be shut down to retrieve it.

Additionally, Minn. Stat. 115A.97 requires that MSW combustors be operated to reduce the toxicity and quantity of ash, and the amount of waste processing residuals that require disposal. Subd. 6 of this statute requires that a permit to build or operate a MWC must contain how the operator will achieve the goals. Minn. Stat. § 115.A.97 (1992). A fractional analysis of the waste stream is necessary in order to develop plans on how to reduce the amount of ash generated.

It is reasonable to require a fractional analysis because the information will allow the MPCA to develop permit conditions specific to the waste stream, will provide the owner or operator a base for developing mercury waste separation plans, and will provide the owner with sufficient information to develop a plan to reduce the amount of ash generated at the facility, and the MPCA with information to review the plan and incorporate conditions of the plan into the operating permit.

Item A. 2 and 3. Subitem 2 of Item A requires a proximate analysis of the waste stream, and subitem 3 requires an ultimate analysis of the waste stream. The proximate and ultimate analyses define generally the chemical characteristics of the waste that are used to design the combustion system and pollution control devices.

Both paragraphs (2) and (3) specify ASTM methods as the basic methods for conducting proximate and ultimate analyses. ASTM standards are recognized by the engineering community as the authoritative source of testing methods and materials specifications. It is reasonable to use industry-accepted standards to conduct the proximate and ultimate analyses. The ASTM methods are contained in Exhibit 2.

Proximate analysis is a simple laboratory test, originally developed to characterize coal. A proximate analysis gives information on the behavior of a solid fuel when it is heated by determining how much of the fuel goes off as gas and tar vapors, called the volatile matter, how much remains as fixed carbon, how much moisture is in the waste and the ash content of the waste.

Volatile matter is that portion which, exclusive of water vapor, is driven off in gas or vapor form when the solid fuel is subjected to a standardized temperature test. It consists of hydrocarbons and other gases resulting from distillation and decomposition processes that occur during combustion.

Fixed carbon is the combustible residue left after driving off the volatile matter. It is not all carbon, and may affect the choice of fuel-firing equipment. In general, the fixed carbon represents that portion of the fuel that must be burned in the solid state. In a proximate analysis, percentage of fixed carbon is a calculated figure obtained by subtracting from 100 the sum of the percentages of moisture, volatile matter, and ash.

Ash is the noncombustible residue after complete combustion of the solid fuel. The weight of ash is usually slightly less than that of the mineral matter originally present before burning. Ash is usually considered the product of complete oxidation of the fuel. It is composed predominately of the oxides formed from the mineral constituents of the fuel.

The ultimate analysis required in the proposed rule measures the total carbon, hydrogen, oxygen, nitrogen, sulfur, and chlorine contents. This information, along with moisture and ash contents, is necessary to properly design the combustion system and air pollution control equipment including computing combustion air requirements, sizing gas handling equipment, determining the configuration of heat transfer surfaces, establishing the physical dimensions of system components and specifying materials of construction.

The total carbon content in the ultimate analysis includes both the fixed carbon and the carbon in the volatile matter. Almost all of this carbon appears in the products of combustion as CO_2, although trace amounts appear as CO and hydrocarbons. Almost all hydrogen in the fuel is burned to water and, together with the moisture in the fuel, appears as water vapor in the combustion gas.

Of particular concern is the element chlorine. The major sources of chlorine in MSW appear to be paper and plastics (Ref. 92). Chlorine is used in paper manufacturing to bleach the pulp, and is used to make certain products, like polyvinyl chloride plastic, insulation and textiles. During combustion, chlorine reacts with hydrogen in the waste and auxiliary fuels to produce hydrogen chloride, an acid gas which is highly corrosive. Chlorine will also react with organics to form chlorinated products of incomplete combustion (PICs), including dioxins, which are highly toxic.

Identifying the amount of chlorine is not specifically included in the ASTM method. The analysis for chlorine content is therefore specifically identified in the proposed rule. A standard of performance for acid gases is contained in the proposed rule. It is reasonable to conduct an ultimate analysis to determine chlorine content in order to estimate emissions of acid gases, and what removal efficiency of air pollution control is necessary to properly control these emissions to meet the standards of performance.

Item A. 4. Subitem 4 of item A requires that the heat value of the solid waste stream to be determined and reported in the permit application. Heat value is expressed in Btu per pound of fuel. Heat value is the amount of heat recovered when the products of complete combustion of a unit quantity of a fuel are cooled to the initial temperature of the air and fuel, thus condensing moisture. The proposed rule specifies that ASTM method E955 shall be used to determine the heating value of the solid waste.

The proposed rules regulates incinerators based on the rated heat input of the waste combustor unit. Currently, incinerators are rated based on the weight throughput. In order to make the shift from rating waste combustors based on the weight of the waste to rating them based on the heat input of the waste, particularly for existing incinerators, it is necessary for the facility owner and the MPCA to know the heat value of the waste. Multiplying the waste feed rate in pounds by the heat value of the waste will yield the feed rate in Btu's. This value is then used to determine the rated heat input rate of the waste combustor, particularly for those waste combustor units that do not generate energy for other uses. The appropriate air emission standards then are applied based on the heat input rate.

As mentioned above, solid waste is a fuel that has characteristics of any other fossil fuel. It derives most of its heating values from its cellulosic content. When shredded and separated into light and heavy fractions, a waste stream is produced that can be used as a fuel.

The heat content of the waste has a direct impact on the amount of waste that can be put through a combustion unit. When managing nonhomogeneous fuels like waste, it becomes more important to know the heat content of the waste. If the heat content is not known, and only the weight of the waste is relied on, waste combustors can be quickly overloaded, thus generating excessive amounts of pollutants. The MPCA has witnessed this problem repeatedly at small incinerators, particularly medical waste incinerators (Ref. 93).

The permittee will generate heat value information to finalize furnace design and/or selection, ancillary equipment specification and design of energy recovery systems. It is reasonable to have this information included in the permit application so that MPCA staff can determine the appropriate standards of performance and evaluate design specifications.

Item B. Item B requests detailed engineering descriptions of the combustion system, air pollution control devices and monitoring systems proposed in the permit application. It is reasonable to request this information, because it allows the MPCA to determine whether the equipment proposed is suitable for the waste stream combusted, and whether the operation and maintenance plans are proper for the described facility. This information is also used to describe the exact equipment permitted by the MPCA to be installed and operated. Many facilities may also need operating restrictions, such as the total annual number of operating hours, in the permit to limit the potential amount of pollutants that could be emitted from a waste combustor. Providing this information to the MPCA will aid in determining what operating restrictions are necessary and possible with the proposed equipment.

Item C and D. Items C and D require a description of the site and ash handling systems. Item C requires that a permit applicant provide a description of the site, and a description of storage space for solid wastes, noncombustible materials, chemicals, recyclables, solid wastes that are not allowed to be combusted, and ash. A site plan greatly assits the MPCA staff in understanding the equipment installation and to conduct enforcement inspections. This rule also proposes that the technical standards applicable to transfer stations also apply to waste combustors. Those technical standards are detailed in current Minn. Rule part 7035.2865. Because the portion of a municipal waste combustor facility in front of the combustor itself is very similar to a transfer station in both design and function, it is reasonable to require site information and to evaluate that information with respect to the transfer station requirements.

Item D requires the submittal of the description of the ash handling system. Ash handling is an ongoing operational and maintenance demand at waste combustors, and requires considerable forethought to keep equipment operating properly to contain air emissions (Refs. 94 and 95). Ash handling is a potential source of fugitive emissions. Fugitive emissions are required to be controlled under existing Minn. Rules pt. 7005.0550, which states:

> No person shall cause or permit the handling, use, transporting, or storage of any material in a manner which may allow avoidable amounts of particulate matter to become airborne....(Minn. Rules pt. 7005.0550 (1991))

A description will help the MPCA evaluate the impacts on neighboring properties of fugitives from waste and ash handling. This information will assist the MPCA in developing ash handling permit conditions that minimize fugitive emissions, and result in proper handling, transport and disposal.

It is reasonable to require this information, because permits are written to control air emissions from the entire facility, including vents, storage piles, tanks, and any other types of emission sources.

c. **Subpart 3. Performance Test Data.** The MPCA is requiring that a permit applicant submit a summary of the performance test data with an application for permit reissuance. Performance testing will show the MPCA how well an existing facility is operating and will enable the MPCA to write specific permit conditions if necessary to bring the facility into compliance with its standards of performance. The required frequency of performance testing is proposed in part 7011.1270, Performance Test, Ash Sampling and Solid Waste Composition Study Frequency. The frequency of testing is such that at least two performance tests will be necessary during the life of the permit.

d. **Subpart 4. Industrial Solid Waste Management Plan.** It is the applicant's responsibility to properly manage all types of waste received at the waste combustor. This subpart requires a permit applicant to submit with its permit application a plan that describes how industrial solid wastes will be managed at the waste combustor. Proposed rule part 7007.0801, Permit Conditions for Air Emission Permits for Waste Combustors, requires the implementation of an industrial waste management plan. The plan must be prepared in accordance with the requirements of 7011.1250. Submitting an industrial waste management plan with the permit application will allow the MPCA to evaluate the applicant's plan and to propose changes if necessary. It will also allow MPCA staff to evaluate the environmental impact of combusting industrial wastes at the waste combustor, and to include operating conditions governing industrial wastes incineration in the permit.

It is reasonable to require an industrial waste management plan so that the MPCA can assess whether the applicant has a realistic approach to industrial waste management.

e. **Subpart 5. Separation Plan for Wastes Which Contain Mercury.** This subpart requires a Class C, D, or III waste combustor owner or operator to prepare a plan that would identify, separate, and collect wastes which contain mercury before combustion. The plan must be prepared in accordance with proposed Part 7011.1255, Plan to Separate Solid Wastes Which Contain Mercury.

Part 7011.1225, Standards of Performance for Waste Combustors, sets forth the proposed mercury emission limit for Class C and III waste combustors. For Class D and IV waste combustors, a plan to separate wastes with mercury is required in place of a mercury emission limit. In order to ensure continuous compliance with this emission limit and to reduce the quantity of mercury emissions from waste combustors, Class C, D, and III waste combustor owners or operator must separate wastes which contain mercury before the waste is combusted.

Mercury that is contained in the waste stream partitions almost entirely to the flue gas, and is not consistently captured in air pollution control devices required at Class C waste combustors (typically electrostatic precipitators with no acid gases control). The cost to install and operate the pollution control equipment necessary to consistently control and measure mercury emissions is prohibitively expensive for Class C and D waste combustors. For post combustion mercury control to be effective, the flue gases must be conditioned as is done to control acid gases. These systems are either duct sorbent injection with a fabric filter (DSI/FF) or spray dryer with a fabric filter (SD/FF). The cost to install and operate the least expensive acid gas control equipment at an existing 200 ton per day mass burn MWC would increase the total operating costs by an estimated $37/ton over the estimated base cost of $89/ton of waste processed. This is an increase of approximately 40 percent. Add-on mercury control would cost an estimated additional one percent (Exhibit 3, pages 46 to 57). While the mercury control is inexpensive if the facility is currently operating an acid gas control system, it is very expensive to first control the acid gases and then mercury. Currently no Class C or D waste combustors in Minnesota operate DSI/FF or SD/FF systems designed to control acid gases. Therefore, these waste combustors would need to first install acid gas control equipment.

As an alternative to post combustion mercury control, Class C, D, and IV waste combustors can remove mercury from the waste stream prior to combustion. To accomplish this goal, these facilities will need to establish programs to ensure that mercury wastes are identified and removed from the municipal, medical and industrial solid waste stream to control mercury emissions. Because mercury is so hazardous and the add-on control equipment is so expensive, it is reasonable to require the owners and operators to provide a plan to separate wastes which contain mercury from the waste stream before it is burned.

The separation plan establishes which wastes will be targeted for removal, as well as methods for disposing of the separated wastes. If the plan is inadequate, or does not properly address disposal of the separated waste, MPCA staff will work with the applicant to produce an effective plan.

Additionally, the plans are proposed to be included as part of the permit for operating Class C, and D waste combustors, which will make them enforceable. In order to incorporate those plans into the permit, the plans will have to be submitted to the MPCA.

It is proposed in this rule making that Class I, II, A and B waste combustors use very efficient air pollution control equipment to remove mercury from the flue gases emitted from the facility. The emission standards are very restrictive, and could not be achieved solely with the separation of wastes targeted in this proposed part. The facilities may choose to separate mercury-bearing wastes from the waste stream, however the MPCA is not requiring that the facilities do so.

Rather the MPCA will allow the facilities to use its resources to achieve statutory requirements as the facility owners see fit. It is therefore reasonable to exempt Class I, II, A, and B waste combustors from preparing a mercury waste separation plan.

f. **Subpart 6. Reducing the Level of Contaminants in Ash.** This subpart is proposed in this rule to comply with Minn. Stat. § 115A.97. The statute requires mixed MSW incinerator permit applicants to state how they will plan and manage MSW incinerator ash to the maximum extent feasible and prudent to (1) reduce the toxicity of incinerator ash; (2) reduce the quantity of the incinerator ash; and (3) reduce the quantity of waste processing residuals that require disposal. Minn. Stat. § 115A.97, subd. 1 (1992). The statute also requires the MPCA to develop rules designed to meet the goals in subd. 1. Minn. Stat. § 115A.97 subd. 3 (1992).

Minn. Stat. § 115A.97, subd. 6 requires that permit applications for municipal waste combustors state how the applicant will "...achieve the goals in subd. 1 of reducing the toxicity of incinerator ash...". The term "toxicity" has an existing unique definition in Minnesota's rules governing hazardous waste. Therefore, this proposed rule uses the phrase "reducing the level of toxic contaminants in ash" to prevent confusion with the existing hazardous waste meaning. The substitution of terms does not compromise the legislative intent of the statute.

Subp. 6 has been proposed in response to the goals and policies established by the Legislature in Minn. Stat. § 115A.97. The level of toxic contaminants in ash can be reduced by focusing on the source of contaminants in the solid waste and by careful management of the end product. Reducing the levels of trace toxic contaminants in MSW will reduce releases of these metals in air emissions as well as ash.

(1) Leaching of Lead and Cadmium from Ash

The focus on sources of toxic contaminants in the waste stream results from data from leach tests conducted on MSW ash. Leach test data is used to predict potential for ground water impacts from landfilling ash. Leach tests have shown that lead and cadmium are frequently present at elevated levels in ash. Item A of this subpart specifically requires the permit applicant to examine lead and cadmium. Item A also requires that plans examine means to reduce both the leachable levels and total composition of toxic contaminants in ash.

The EPA has developed a new leach test called the "Synthetic Precipitation Leach Test for Soils," referred to as "Method 1312" in this report. The test is also known as the Synthetic Acid Rain test. This test uses a combination of nitric and sulfuric acid at a pH of 5 or 4.2 to simulate the effect of acid rain on wastes in a monofill. The acid is not replenished in during the leach test, which allows the buffering capacity of the waste to dictate the pH during extraction. This results in less leaching of most metals.

To collect data which most closely predicts actual leachate properties of monofilled ash, and to address the potential problems with the use of other toxicity tests, the MPCA has required quarterly testing of incinerator ash using the Method 1312 leach test. The MPCA chose this test when establishing the Temporary Management Program for Mixed Municipal Solid Waste Incinerator Ash, as amended May 23, 1989. This requirement has now been incorporated into rules governing the management and final disposal of waste combustor ash (Minn. Rules pt. 7035.2885, subd. 4).

Results show that lead is present in leachate produced by the Method 1312 analysis of bottom, fly and combined ash. Using the Method 1312 leach test on Minnesota's incinerator ash, cadmium was leached at fairly low levels from bottom and combined ash, but at very high levels from some fly ash samples. Lead results varied greatly between facilities.

In general the data indicate that lead, cadmium and other metals are present in incinerator ash and could potentially leach from ash in a monofill. Reducing the amount of these metals in the ash by removing them from the waste before it is incinerated would clearly reduce the potential for harm to human health or the environment from waste combustor ash disposal.

The comment has been made that should results of leachate tests indicate that the level of toxics are below some established level, the MWC permittee should no longer investigate or conduct activities to reduce the toxic contaminants in ash. This comment appears to be contrary to the intent of the statute requiring reduction of contaminants in ash which are toxic. The statute does not provide for cessation of toxics reduction efforts once a certain level of toxicity is reached. Reduction of the total content of toxics in ash is necessary to minimize health concerns related to exposure to fugitive ash, ash utilization projects and leachate from ash that is land disposed. Additionally, mixed municipal waste streams can vary significantly over time. One or even several tests showing low levels of toxics does not guarantee that the level will always be at or below that level. Therefore, no provision for exemption from complying with this subpart has been proposed.

(2) Removal of Toxics from the Waste Stream

In order to determine whether certain items can be removed from the waste stream to reduce the level of contaminants in ash, the sources of contaminants in the waste must be identified. Two recent studies provide significant data on sources of contaminants in incinerator ash. As discussed above, lead and cadmium are the two contaminants which have been found in ash most frequently at levels of concern.

A comprehensive 1989 study was conducted by Franklin Associates for EPA on the sources of lead and cadmium in manufactured products in the MSW stream (Ref. 96). The "Franklin Report" identifies lead acid batteries and consumer electronics as the major sources of lead in manufactured products in the municipal waste stream. These two items account for 92 percent of lead, even with Franklin's assumption that 80 percent of lead acid batteries are recycled. See Table 3.

Table 3. Discards of Lead to the Municipal Solid Waste Stream
United States, 1986

Source	Tons	Percent of Total Pb
Lead Acid Batteries	138,043	64.6%
Consumer Electronics	58,539	27.4%
Glass and Ceramics	7,956	3.7%
Plastics	3,577	1.7%
Cans & Other Shipping Containers	2,052	1.0%
Pigments		0.5%
Lightbulbs		0.4%
Collapsible Tubes & Wine Wrappers		0.4%
Used Oil		0.1%

The Franklin Report indicates that 97.6 percent of the lead in the manufactured products is contained in the noncombustible fraction of MSW. This study does not account for lead sources that are not manufactured products.

Further, these statistics identify the lead content of the waste stream, not the sources of leachable lead in ash. Smaller sources of lead and lead found in other fractions of the waste stream may actually account for significant leachable lead quantities.

Cadmium sources have similarly been identified in the Franklin Report. The three sources listed in Table 4 account for 89 percent of the cadmium in the manufactured products in MSW.

Table 4. Discards of Cadmium to the Municipal Solid Waste Stream
United States, 1986

Source	Tons	Percent of Total Cd
Household Batteries	930	52%
Plastic		
Nondurables 1/	240	13.4%
Durables 2/	262	14.7%

Notes:
1) Nondurables includes nonfood packaging, clothing, footwear, and other misc.
2) Durables includes housewares, toys, records, luggage, furniture, and other misc.

Another recent investigation into the behavior of lead and cadmium was conducted at the Burnaby municipal waste combustor. This study was designed to evaluate the composition of MSW, identify the quantity of various metals in each of the components of the waste, and then to determine the fate of metals when the waste is combusted. The Burnaby waste combustor is a massburn, waterwall combustor with dry sorbent injection, fabric filter, and sodium sulfide injection for mercury control.

Figure 3 shows the distribution of four metals, lead, cadmium, chromium and mercury from the Burnaby study. As shown, for lead, chromium and mercury, most of these metals were found in the organic fraction of the waste stream. (Organics include yard and garden wastes (10.9%), branches (2.5%), food waste (3.32%), finished wood (3.29%), unfinished wood (6%), textiles, leather, rubber, footwear, and other.) This fraction and the paper fraction make up about equal quantities of the Burnaby waste stream (Ref. 97). Note the significant contribution to the waste stream's lead and mercury content from paper; plastic contributes both lead and cadmium in significant portions.

After sorting, the waste was incinerated, and air emissions were tested at a point after the air pollution control device. From this information, correlations between waste content and air emissions were sought. Sort categories that correlated with metal emissions at an 80% confidence level were noted. Changes in incinerator emissions at Burnaby were related to the following categories:

Colored plastics and alkaline batteries with cadmium;
Other colored plastic housewares and lawn and plant trimmings with lead and selenium;
Clear glass containers with barium and antimony.

Four components contributed significant quantities of metals to the waste stream. However, the authors of the Burnaby study state that the presence of these components probably does not effect stack emissions:

Residual mixed paper is high in cadmium, mercury, nickel, lead, and tin;
Yard and Garden waste is high in arsenic, cadmium, chromium, copper, mercury, nickel, lead, antimony and tin;
Light Construction debris is high in antimony, lead and mercury;
Fines (material less than 1/2" in diameter) are high in arsenic, chromium, copper, mercury, nickel, lead, antimony, and tin.

Results from Burnaby both support and refute some of the findings of the Franklin study. The Franklin study suggests that 52% of the cadmium in the waste stream is from household batteries, which is supported by the Burnaby results. Franklin predicted that lead acid batteries would supply the greatest quantity of lead; none were found in the Burnaby waste composition analysis. Several metal and electrical components were not analyzed for total metals. Given the composition of small appliances, the authors note that these items should be examined as potentially significant sources of metals. Overall, the conclusions drawn from the Burnaby study indicated that for this municipal waste combustor and its waste shed, manufactured items are not the major source of many metals of concern. The composition of this waste stream even suggests that this waste would not comply with standards for finished compost in Minnesota.

(3) Feasibility

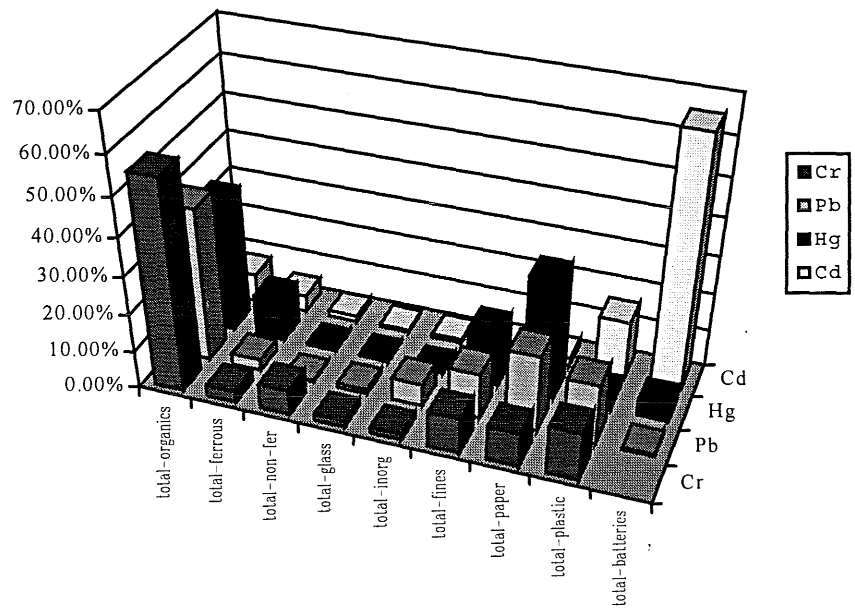
It is feasible for incinerator owners and operators to meet the requirements of this part. First, the rule uses the language "to the maximum extent feasible and prudent", preventing the MPCA from requiring measures which are not feasible. Second, subd. 5 of Minn. Stat. § 115A.97 directs that a county solid waste plan that includes the use of MSW combustion must also meet the goals of subd. 1. Owners and operators are expected to work with county solid waste management planners to make changes in solid waste management policies to meet the requirements of this part.

Third, there are a number of tools already in place or soon to be in effect that support waste combustor operators' and solid waste managers' efforts to remove toxic contaminants from the waste stream.

The Minnesota Legislature has already enacted legislation intended to remove some of the potentially large sources of lead and cadmium which were identified by the Franklin Report and in the Burnaby study. These steps may help reduce the level of contaminants in ash. Legislation includes the following:

1) Yard waste is banned from the MSW stream. Less than 4% of the waste found in the MSW composition study was yard waste (Ref. 98).

Figure 3.
Sources of Metals in Municipal Waste--Burnaby, Vancouver



2) In 1990, the Minnesota Legislature passed legislation that prevents the sale of rechargeable consumer products unless the nickel-cadmium batteries (the battery used in rechargeable tools and appliances) are removable by the consumer, and the product and the battery are both labeled in a manner that is clearly visible. (Minn. Stat. § 325E.125, subd. 3) The intent is

to allow the consumer to remove the battery before disposal, or allow the consumer to replace the battery, therefore precluding the appliance from being disposed of in its entirety.

3) Minn. Stat. § 115A.9155 prohibits batteries used by a government agency, or an industrial, communications, or medical facility from being placed in the MSW stream. Further, the manufacturer of batteries must ensure that a system for the collection, transportation, and processing of waste batteries exists for purchasers in Minnesota. This requirement, if enforced strictly, would address a significant portion of the cadmium in the waste stream.

4) The legislature, in its 1989 special session, required recycling of collected lead acid batteries, and placed a surcharge on the purchase of new lead acid batteries in order to encourage Minnesota consumers to trade in their used lead acid batteries, rather than throwing them away. (Minn. Stat. §§ 325E.115, 325E.1151) A representative of Gopher Refining, a secondary lead smelter in Minnesota, states that Minnesota's lead acid battery recycling rate is higher than the national average, due solely to this legislation.[8]

5) The Minnesota Legislature in 1991 also required the removal of metals from packaging in Minnesota. After August 1, 1993, no packaging may be used or products sold in packaging that contains mercury, lead, cadmium, or hexavalent chromium. The statute provides for a schedule to remove the toxics, and a means of exemption from the statute's prohibition for items manufactured prior to August 1, 1993, if needed to meet federal or state health or safety laws, or if there is no feasible alternative to the metal in packaging. This statutory ban will further MWC operator's effort to reduce the level of contaminants in ash, and in the case of mercury, reduce the amount of air emissions. This particular waste stream could account for a substantial portion of the residual mixed paper, a significant contributor of metals to the Burnaby waste stream.

8 Telephone conversation between Mr. John Tapper of Gopher Smelting and Ms. Anne Jackson of the MPCA, January 1991.

6) Major appliances may no longer be placed in the solid waste stream. Minn. Stat. § 115A.9561. This means that if clothes washers and dryers, dishwashers, water heaters, residential furnaces, garbage disposals, trash compactors, conventional and microwave ovens, ranges and stoves, air conditioners, dehumidifiers, refrigerators and freezers are placed out for garbage pickup, the waste hauler either leaves it, or must deliver it to an appliance processor. This statute was designed to segregate wastes which are very difficult for MSW incinerators and solid waste land disposal facilities to handle, and to encourage recycling. This statute will in part assist municipal waste combustors in achieving the goal of Minn. Stat. § 115A.97, subd. 1 (3): by the reducing of the amount of residuals that require disposal. HERC operators report that the number of appliances the facility receives has dropped since this statute went into effect (Ref. 99).

This rule does not propose to ban wastes from waste combustors that have not previously been banned statutorily. Banning wastes from waste combustors results in an uneven application of bans in Minnesota, and would result in confusion about how to dispose of wastes. Municipal waste combustors in Minnesota do not serve every waste generator. The method by which waste is managed depends on which county a Minnesotan lives in or works in. The methods vary between counties; some counties landfill directly, some compost, while others use waste combustion for volume and weight reduction. It is preferable that the Minnesota Legislature address waste bans statewide, so that alternative waste management systems for the banned wastes are properly provided for, and that bans are evenly applied.

A number of municipal waste combustor operators have commented that they are not in a position to control the waste burned at the facility. The owner and operator are, however, responsible for the waste accepted at a facility. The waste combustor may choose to work with local solid waste officials, haulers and solid waste generators in education programs, may separate waste collection systems, or may even install waste processing equipment prior to incinerating waste.

For example, an MWC's plans for toxic contaminant reduction could focus on improving identification, management and disposal of legislatively-banned materials. Plans could include identifying the amount of banned materials or wastes that are difficult for a waste combustor to manage that are currently in the waste stream. These quantities could then be reported to the counties providing waste. Because the statute requires the counties supplying the waste and the MWCs to cooperate, they could develop supporting education and enforcement activities to reduce the amount of unacceptable material in the waste stream.

Alternatively, a waste combustor could install equipment to process the waste before burning the acceptable portion of the waste. This system would be designed to process waste delivered to a massburn waste combustor to remove glass, ferrous, aluminum, corrugated paper and newsprint. There are several benefits to a facility from installing a waste processing system described above. Combustion equipment wear can be reduced and the amount of ash generated can be reduced. Combustion improvements may or may not result from waste processing, particularly when removing combustibles. Decreased combustibility could be experienced, requiring the use of more auxiliary fuel.

The MPCA developed estimates of capital and annual costs to operate a system to remove glass, ferrous, aluminum, corrugated paper and newsprint. (A detailed description of this system is provided in Exhibit 3). For a Class II/Class C waste combustor, a waste processing system has a capital cost of $840,000. Annual operation and maintenance costs associated solely with this system are estimated at $903,000, or about $30 to $40 per ton of waste processed. These costs reflect a 75 percent increase in annual operation and maintenance budgets of Class C waste combustors currently operating in Minnesota.

The environmental benefits have not yet been borne out for the MPCA to believe that it is reasonable for the MPCA to mandate waste processing at an additional $40/ton.

In summary, it is reasonable to allow permittees to choose the means by which they will reduce toxic contaminants in ash, and the quantity of ash produced, as well as the amount of nonprocessible waste, and to simply require permittees to submit their plan with the permit application. Legislation has been passed setting up waste management systems to remove a number of the sources of toxics. This will assist MSW combustor owners and operators in meeting the requirements of this part. No specific goals or timetables are required by statute, so that compliance with this part requires that the owner or operator make a reasonable effort to meet the legislative objectives. It does not necessarily require significant changes to facility design or operation, and should not present a hardship for facilities.

Subd. 5 of Minn. Stat. § 115A.97 directs the Office of Waste Management, in cooperation with the MPCA, the counties, and the metropolitan council, to develop and propose statewide goals and timetables for the reduction of the noncombustible fraction of mixed MSW prior to incineration or processing into refuse derived fuel and for the reduction of the toxicity of the incinerator ash. By January 1, 1990, the Office was to report to the Legislative Commission on Waste Management on the proposed goals and timetables with recommendations for their implementation.

The Office of Waste Management prepared and presented its report concerning solid waste incinerator ash quantity and toxicity reduction to the Legislative Commission on Waste Management in January 1990. This report concludes "...it is not appropriate at this time to establish specific goals and timetables for ash toxicity and quantity reduction or to recommend implementation strategies beyond those already in statute" (Ref. 100). This conclusion was reached due to the lack of comprehensive and consistent data regarding the constituents of ash in Minnesota.

Since this report was prepared, the MPCA has promulgated MSW ash testing rules. Results of this testing are being analyzed by the MPCA's Ground Water and Solid Waste Division staff, in part to develop rules for ash utilization projects.

Due to the lack of conclusive data that would enable the MPCA to propose more specific means, the proposed rule provides reasonable direction to the permit applicant to achieve the goals established by the Legislature for reducing the levels of toxic contaminants in ash. Further rulemaking may be necessary if OWM should re-evaluate the conclusions of the 1990 report, and find that specific activities beyond what has already occurred in the state are necessary. In order to assist municipal waste combustors in Minnesota in complying with the statutory goals, OWM may need to evaluate the recent developments in waste characterization and ash treatment and use techniques, to specify ash toxicity and reduction strategies.

(4) Relevance to Air Quality Rules

Metals that enter the waste combustor have only three points where they will exit: in the ash collected in the bottom of the waste combustor, in fly ash, or in the exiting flue gases. As discussed, metals in ash are a problem because they potentially will leach out of the ash, or they can be inhaled if ash becomes a fugitive emission. Metals in the air stream will be deposited some distance downstream, and could result in foodchain impacts.

The rules governing the planning for the reduction of ash toxicity have been placed in the waste combustor rule because the statute requires that the reduction of the contaminants in ash must be given consideration with the permit application to combust waste. This proposed subpart governs the content of the permit application, thus it is reasonable to place the requirement in this part. The owner/operator of a waste combustor needs to know there is a statutory requirement to reduce the level of contaminants in ash and the quantity of ash.

Data submitted to the MPCA with annual reports required by Minn. Rules pt. 7035.2910 will be used by the MPCA to assess achievement in reducing ash toxicity. The MPCA intends to report progress in meeting these goals to the Legislature every two years as part of the solid waste policy report the MPCA is required to prepare. Minn. Stat. § 115A.411 (1992).

Subd. 6 of Minn. Stat. SS 115A.97 requires that both the initial application for a municipal waste combustor permit and applications for permit reissuance must address how the applicant will achieve the goals of Minn. Stat. § 115A.97, Subd. 1. Because the plan is submitted with the permit, and is intended to be incorporated into the permit itself, the plan will be available for public comment at the time draft permits are public noticed for issuance. Based on data generated during the life of the permit, plans could be modified and improved with each permit issuance as successes and failures of programs are documented.

(5) Relation Between Air Emission Restrictions and Ash Quality

It is recognized that this proposed rule will place restrictive air emission limitations on municipal waste combustors. These restrictions will have two impacts for ash. First, the restrictions will increase the amount of ash generated, due to the increased particulate matter capture efficiencies and because lime is added by scrubbers (Ref. 101). Second, the level of toxic contaminants in ash could increase, due to the capture of finer particulate matter.

During the process of cooling the gas stream, many pollutants condense or agglomerate and become fine particulate matter. This particulate matter is captured by control equipment. It is thus expected that the quantity of toxic contaminants in flyash will increase, due to the decreased air pollution. Reduction of items that contribute metals to the waste stream may offset the increased capture efficiencies, however, reductions may not affect air emissions when very efficient air pollution control devices are used.

Lime, carbon or sodium sulfide additives might be used at some municipal waste combustors for acid gas control, or to meet mercury or dioxin emission standards. The quantity of contaminants in the ash could possibly be offset by the volume of flue gas additives used, which would have some dilution effect. Addition of lime also increases the pH of ash leachate, which affects the leaching potential of some metals, including lead. The leaching potential of lead increases at low and high pH. At a high pH, the leaching potential of cadmium decreases.

The MPCA is presently unable to quantify how many additional contaminants will be present in ash as a result of improved air pollution control equipment. The MPCA has made some preliminary estimates about the increased quantity of ash generated from the addition of more efficient air pollution control equipment. It is likely that there will be a small increase by weight in the ash collected from an MWC with the addition of scrubbing equipment.

The MPCA does not believe it is reasonable that, upon the installation of air pollution control devices, the permittee should be required to modify its waste management programs if there were increases in the ash contaminant content or ash quantity merely from the installation of air pollution control equipment. Therefore, Item B of this subpart contains language that acknowledges the effects of upgrading the air pollution control equipment on ash generation.

To assess reduction in the quantity of ash produced, the ratio of ash to waste burned will be used. For example, a ratio of ash to waste of 1:5 is an improvement over a ratio of 1:4. This indicates that less noncombustible waste is going through the waste combustor. Therefore, this comparison will also be used as the measure of noncombustibles, to satisfy the requirements of subp. 3 of Minn. Stat. § 115A.97. In calculating this ratio, the amount of excess lime contained in ash as a result of the dry scrubbers will be subtracted from the amount of ash produced. The amount of metals recovered after incineration, however, should not be subtracted, because it is the policy of the legislature that such noncombustibles should be removed from the waste stream prior to combustion. (Ref. Minn. Stat. § 115A.03, subd. 25a, Recyclable Materials definition).

It is reasonable to implement legislative intent in this case through maintaining the flexibility each owner/operator needs to develop a plan that is most suitable for the facility. The proposed rule meets the legislative intent for the reduction of ash toxicity. The MPCA believes that reducing ash toxicity is a long-term effort that will rely not only on careful waste stream management, but policy decisions by the Minnesota Legislature and United States Congress to change consumer behaviors and preferences as well.

g. **Subpart 7. Ash Management Plan**. The 1989 Legislature directed the MPCA to

> ...require as part of the permit application for a waste incineration facility identification of preliminary plans for ash management and ash leachate treatment or ash utilization. The permit issued by the agency must include requirements for ash management and leachate treatment.

Minn. Stat. §116.07, subd. 4j(b) (1992)

This statute specifically affects the MPCA's permitting process in two ways: first by requiring the permit applicant to identify processes for ash treatment and/or sites for ash containment and, secondly, by requiring the MPCA to place ash management provisions in the permit which authorizes construction and operation of the air emission facility.

The proposed subp. 7 is to remind the permit applicant that the application must identify ash management plans in the permit application. The MPCA is required by statute to develop permit conditions relating to ash management. The information is required in the permit application to develop site-specific requirements for the management of ash. It is reasonable to remind the applicant of the applicant's statutory responsibilities.

4. REASONABLENESS OF PART 7007.0801--CONDITIONS FOR AIR EMISSION PERMITS FOR WASTE COMBUSTORS

This is a new part which establishes conditions that must be included in an air emissions permit for waste combustors.

a. **Subpart 1. Additional Permit Conditions.** Subp. 1 identifies that these conditions are to be included in the permit along with requirements of the operating permit rule found in Minn. Rules pts. 7007.0800.

b. **Subpart 2. Mixed Municipal Solid Waste or Refuse-Derived Fuel Waste Combustors.** Subp. 2 describes permit conditions for municipal waste combustors.

Item A and B. Item A of Subp. 2 requires the permit applicant to acquire the commissioner's approval of its ash management method before construction of the municipal waste combustor. Item B prohibits the operation of the MSW combustor until the facility approved under item A is available to accept ash. These permit conditions provide the MPCA means of ensuring that the permit applicant has indeed fulfilled its obligation to acquire an ash disposal site, whether that site is within Minnesota or not. It is reasonable for municipal waste combustors to obtain approval of their ash management plan prior to construction of the waste combustor, because a great deal of money could be wasted if a facility were to begin and/or complete construction and have no place to dispose of the ash.

HERC was scheduled to start operating its municipal waste combustor located in downtown Minneapolis in August 1989. However, due to the lack of an ash storage area, startup was postponed. Hennepin County had a permit from the MPCA to construct an ash monofill at the Woodlake Landfill in Medina. The completion of that monofill was originally projected to be mid-October 1989. However, it became evident that the monofill would not be ready soon enough for HERC to meet its contractual obligations with Hennepin County. Hennepin County ultimately secured an alternative site for disposal of HERC's ash in Illinois.

The Legislature, although unable to affect the ash management program undertaken by HERC and Hennepin County, was concerned about the continued possibility that municipal waste combustors would not have adequate plans for ash disposal or would export ash from Minnesota, if sufficient lead-time was not given to ash disposal planning. The Legislature thus enacted Minn. Stat. § 116.07, subd. 4j (b). This states:

> The agency shall require as part of the permit application for a waste incineration facility identification of preliminary plans for ash management and ash leachate treatment or ash utilization. The permit issued by the agency must include requirements for ash management and leachate treatment. (1992)

The Legislature, by requiring the MPCA to place ash management and leachate treatment in the permit for the waste combustor, intends owners or operators of municipal waste combustors to give consideration to ash management well in advance of the startup of a waste combustor. It is reasonable, therefore, to prohibit construction or operation until the plans are approved and the ash facility is actually ready to accept the ash.

Items C and D. Items C and D of this proposed subpart are included because Minn. Stat. § 115A.97, subd. 3 requires the MPCA to develop rules to establish techniques to measure the noncombustible fraction of mixed MSW prior to incineration and for at least the testing, management and disposal of incinerator ash. In the recently completed rulemaking activity for managing and disposing of MSW ash, rules were developed for solid waste measurement and ash testing techniques. Items C and D have been proposed in this rule to include the testing conditions promulgated in the ash management rules for municipal waste combustor permittees. It is reasonable to implement statutory requirements and to use existing techniques to do so.

Item E. Item E requires a permittee to implement an industrial waste management plan. The industrial waste management plan must be submitted with the permit application. The MPCA will review the plan to ensure that the wastes proposed to be accepted at the municipal waste combustor are compatible with the facility, that wastes that are not acceptable are properly separated and disposed of through other means, and that impacts to operations and air emissions can be quantified. The statement of reasonableness of proposed part 7011.1250 discusses the specific types of waste that the industrial waste management plan must address, and the hazards associated with the waste. These wastes are specified because their combustion or mishandling will result in putting solid waste workers in jeopardy (i.e. infectious or spontaneously combustible wastes), have known adverse human health impacts if inhaled (asbestos), or have special consequences if released to the environment (PCB's less than 50 ppm).

If the facility does not intend to accept any of the specified wastes, the plan must express that commitment and indicate what measures will be taken to insure that the wastes are not combusted.

By making the industrial waste management plan a condition of the permit, the plan becomes enforceable. If the waste combustor owner or operator does not comply with the plan, then the MPCA can use appropriate enforcement means to remedy the noncompliance. It is reasonable to require a plan because not all facilities are appropriate to all wastes. It is reasonable to require the facility to plan its operation so that only acceptable wastes that are suited to the equipment are accepted for combustion.

Item F. Item F requires the implementation of a plan to identify, separate and collect solid wastes which contain mercury before the mercury is combusted.

Proposed part 7011.1255 contains the contents of plan that addresses the largest sources of mercury in the waste stream: batteries, electrical devices and switches, electric lighting components, and solid wastes from laboratories where mercury is used. Proposed part 7007.0501 requires that Class C, D, and Class III waste combustors submit this plan with its permit application. Item F will incorporate this plan into the operating permit for the waste combustor facility, thus making the plan an enforceable part of the permit.

It is reasonable to require Classes C, D and IV to implement this plan for the reasons discussed in the material on mercury in the need portion of the statement, and discussed on support of 7007.0501, subp. 5 requiring applicants to prepare a mercury separation plan.

c. **Subpart 3. Waste Combustors or Nonmixed Municipal Solid Waste.** Subp. 3 is proposed to establish special conditions of the air emissions permit for waste combustors that are not combusting MSW or refuse-derived fuel. The distinction is made between municipal waste combustors and other waste combustors, due to vastly larger quantities of waste combusted in municipal waste combustors over all other waste combustors. The amount of ash generated by non-MSW combustors is Minnesota is much smaller than MSW waste combustors. This subpart is thus proposed to address ash testing and management requirements for other waste combustors.

Item A. Item A prohibits operation of the waste combustor until the permittee has an ash management plan approved by the commissioner. Ash from these combustors is not as hard to manage because of the very small quantities generated, and potentially a greater number of disposal options. The ash is managed by solid waste landfills' industrial waste management plans required by Minn. Rules pt. 7035.2535, subd. 5. The MPCA does not believe it is necessary to disrupt the current means of disposal of ash from these small facilities. Therefore it is reasonable to allow these facilities to begin construction before the ash management plan is approved.

Item B. Item B requires that the permit shall specify ash testing schedule. Ash must be characterized in order to determine whether the ash is hazardous or not. If ash is hazardous, it must be sent to a waste landfill capable of containing hazardous wastes. The permit can be drafted to contain a procedure for this determination. It is reasonable to require ash testing to know how to manage the ash.

Item C. Item C requires a waste combustor operator to implement an industrial waste management plan. As described in Subp. 2, item E of this proposed part, industrial waste management plans are required so that the MPCA can insure that the industrial wastes proposed to be handled at the facilities are compatible with the facility, that wastes that are not acceptable are properly separated and disposed of through other means, and that impacts to operations and air emissions can be quantified. Part 7001.1260 describes the wastes for which an industrial waste management plan must be prepared.

If the facility owner/operator does not intend to manage the specified wastes, then the plan must express that commitment, and indicate what measures will be to insure that those wastes are not accepted.

By making the industrial waste management plan a condition of the permit, the plan becomes enforceable. It is reasonable to require a plan, because not all facilities are capable of accepting all wastes. The facility must plan its operation that only acceptable wastes are combusted.

Item D. Item D requires that the permittee's plan for wastes which contain mercury also be a condition of the permit. Since the MPCA and the permittee are relying on the separation of wastes which contain mercury as a means to control mercury emissions, it is very important that this plan be considered a permit condition, much like an actual mercury emission standard would appear in a permit. The mercury waste management plan becomes an enforceable condition of the waste combustor air emissions permit. Failure to comply with the plan will result in release of mercury to the atmosphere, contrary to the specific purpose of the management plan. It is reasonable to incorporate the mercury separation plan into the permit to ensure compliance with the plan.

C. REASONABLENESS OF PROPOSED AMENDED MINN. RULES CHAPTERS 7011 AND 7017

This portion of the proposed rule amends the technical requirements specific to various source categories. The activity of waste combustion affects standards of performance for indirect heating equipment ("boilers") when this source uses MSW or refuse derived fuel to replace some portion of its current use of fossil fuels. Direct heating sources (dryers, for example), also may use solid waste as a fuel, although this practice is not likely to be widespread. The standards of performance for indirect heating and direct heating equipment in Minnesota Rules Chapter 7011 are amended in this rule making.

The requirements applicable to waste combustors are also detailed in this portion of the rule. The standards of performance for incinerators, Minn. Rules pts. 7011.1201 to 7011.1207, are revised in this rulemaking. Minn. Rule 7011.1201, Definitions, is expanded, while the remainder of the applicable existing standards are repealed. The proposed parts 7011.1205 to 7011.1285 contain the permit application requirements and permit conditions specific to waste combustors, as well as the standards of performance for waste combustors.

Continuous monitoring of flue gas emissions is specified in this rule making. Chapter 7017 of the air quality rules is also amended to incorporate recently promulgated federal standards for the operation of carbon monoxide (CO) monitors.

1. Reasonableness of Part 7011.0551 Record Keeping and Reporting for Units Directing Combusting Solid Waste

a. Subpart 1. This part is proposed to inform solid fuel fired boiler owners or operators who combust RDF of their duties under both federal regulations and state statute to report MSW or RDF use and how compliance with the RDF usage limitations is determined.

The combustion of MSW and refuse derived fuel in "boilers" is regulated under this proposed rule. This part is proposed to amend rules pertaining to indirect heating, fossil fuel-burning equipment.

Many counties in Minnesota are processing MSW into refuse derived fuel. Three of the MSW processing facilities do not have dedicated waste combustors for this fuel. Rather, the counties are relying on selling the refuse derived fuel to large industrial or utility boiler operators.

Under the Clean Air Act of 1990, the standards of performance for waste combustors do not apply to those fossil-fuel burning emission units that combust 30 percent or less of MSW by weight of their total fuel input. 42 USC 7401, Section 129 (g)(5). EPA incorporated this requirement into the federal new source performance standards and the emission guidelines for large and very large municipal waste combustors.

In 40 CFR 60.50a (d). co-fired units are exempt from all provisions pertaining to the combustion of MSW, and instead, must report the amount of solid waste used as fuel. Federal regulations exempt facilities that burn less than 250 tons per day total from the reporting requirements, provided that the facility holds a permit which is federally enforceable. 40 CFR 60.50a (e). Under 40 CFR 60.59a (m) and 60.39a, the owner or operator of a plant that has the capacity to combust up to 250 tons per day of MSW shall submit quarterly reports of the daily weights of MSW and each other fuel fired. (Under 40 CFR 60.51a, MSW is defined to include RDF.) EPA will be proposing similar language for reporting solid waste use at smaller waste combustors as directed by the Clean Air Act.

Minnesota has incorporated similar solid waste combustion requirements into statute. Minn. Stat. §116.90 allows all existing and new solid fuel fired boilers to combust RDF, which can make up to 30 percent by weight of the fuel feed stream. The owner or operator must provide a statement that the use of RDF does not involve a modification or only a minor modification to the boiler, demonstrate that the use of RDF will not cause a violation of emission limitations or ambient air quality standards, declare that the RDF is manufactured under specific conditions, and that prior notice is given the commissioner of the MPCA of the amount of RDF expected to be used, and the date the use is expected to begin. These requirements are clearly described in the statute and so are not further expanded in the proposed rule.

The MPCA has not proposed to adopt the exemptions from reporting as contained in 40 CFR 60.50a (e), as Minn. Stat. 116.90 does not contain such relief.

b. **Subpart 2.** Subpart 2 requires that the determinination of the percentage of MSW or RDF combusted be made by calculating the ratio of the amount of mixed MSW and RDF to the total amount of fuel combusted in each 24 hour period. This subpart incorporates the method for calculation from federal regulation 40 CFR Part 60.59a, which specifies that this determination shall be made on a "daily basis". The MPCA has clarified this to mean on a 24 hour basis for ease in calculation and determining compliance.

c. **Subparts 3 and 4**. These subparts incorporate reporting requirements of federal regulation 40 CFR Part 60.59a for record keeping and reporting.

It is reasonable to adopt the federal requirements for units co-firing waste, as the federal regulations provide a method for measurement that is in keeping with the requirements of Minnesota statute, and will not result in duplicate or additional calculations by the facility or the MPCA in order to determine compliance with standards.

2. Reasonableness of Part 7011.0625--Record Keeping and Reporting for Units Directly Combusting Solid Waste

This part parallels the requirements of proposed part 7011.0551 applicable to indirect fired equipment to report solid-waste based fuel usage. Direct-fired equipment are those process units where the products of combustion come into direct content with the material being heated. Examples of this process include the drums in asphalt plants where the aggregate is heated before the warmed asphalt is added, "burn off" ovens where painting accessories are cleaned, and dryers. These process units most often use liquid or gaseous fuels, however, it is possible that they may use a solid fuel like wood waste or coal to generate heat.

As discussed in the statement of reasonableness for proposed part 7011.0551, both the CAA and Minnesota statute provide conditions under which MSW and RDF can be combusted without being regulated as a waste combustor. In developing Minnesota's statute, the Minnesota Legislature considered the difficulty Minnesota's RDF manufacturers were having in marketing their product to solid fuel users in the state. The solid fuel users, primarily industries and utilities using coal or wood to generate steam or electricity, were reluctant to use RDF due to concerns about the fuel quality, but also because it was potentially expensive and time-consuming to obtain the proper air emission permits to undertake the fuel switch. In order to ease some of the difficulties related to air emissions permitting, the Legislature provided the exemptions in Minn. Stat. SS 116.90 for solid fuel fired boilers that used RDF as a portion of their fuel feed.

Industries with direct heating equipment potentially could combust solid fossil fuels, including RDF. In fact, RDF is being combusted at one of the RDF producers to provide heat to the producer's own RDF production process. If this proposed rule did not address allowing direct heating equipment to combust RDF, it is possible that the RDF producer would have to cease combusting the fuel it produces, and find an alternative fuel, such as wood. The intended consequence of Minn. Stat. SS 116.90 is not to eliminate existing uses of RDF, but to ensure that permitting procedures do not act as a hindrance to acceptable use of RDF. The MPCA does not believe that this practice of combusting solid fuel in direct heating equipment is widespread in Minnesota, as the solid particles generated from combustion of solid fuel will come into contact with the material being heated, an undesirable result at most applications of direct heat equipment. Therefore, it is proposed to extend the exemption of allowing the combustion of up to 30 percent by weight of solid waste in direct heating equipment. This proposed part requires the same record keeping and reporting requirements as proposed part 7011.0551, and is a reasonable extension of federal and state requirements regarding the cofiring of MSW and RDF in solid fuel-fired equipment.

3. Reasonableness of Part 7011.1201 Definitions

The following addresses the reasonableness of the proposed new and amended definitions of key words and phrases used in these proposed rules. It is reasonable to include definitions in the proposed rules to provide a consistent understanding of the terms used in this rule.

a. Subpart 1. Scope. This subpart states that the definitions in part 7011.1201 of this proposed rule apply to the terms used in parts 7007.0200, 7007.0250, 7007.0501. 7007.0801. and 7011.1201 to 7011.1285. This section provides guidance to the user as to where to find definitions of the terms used in the waste combustor rules.

b. Subpart 1a. Statutes and Other Rules. This subpart states that the definitions in Minn. Stat. §116.06, and Minnesota Rules Chapters 7005, 7007, 7009, 7011, and 7017 apply to the terms used in parts 7011.1201 to 7011.1285, unless the terms are defined otherwise in this part. Because the proposed rules are a part of the state air pollution control rules, it is reasonable to use definitions consistent with other parts of the state air pollution control rules, unless there is a need to define these terms differently to achieve the regulatory objective of these proposed rules.

The definitions in existing subparts 2, 3 and 4 are repealed. Subpart 2 defined "incinerator." The modified definition of "incinerator" is now placed in alphabetical order in this part, as amended. Subpart 3 contained a definition for solid waste which was revised by the MPCA in recent revisions to the solid waste rules. The modified definition of "solid waste" is placed alphabetically in this amended part. Subpart 4 defined "burning capacity," a term that was used in the standard of performance that is being repealed by this rule. The term is not used in this proposed standard of performance. The definition is therefore being repealed.

c. Subpart 5. Accurate and Valid Data. The term "accurate and valid data" is defined due to its use in Minnesota Stat. § 116.85 Subds. 2 and 3. If continuous emission monitoring or stack testing data shows the waste combustor to be out of compliance, based on "accurate and valid data", the waste combustor is required to notify the MPCA commissioner, undertake repairs to remedy the noncompliant state, or cease operation if the facility cannot be brought into compliance within a certain number of days as specified by the statute. The point at which the data becomes accurate and valid must be defined, because it is at that point that action must be taken by the facility and/or the commissioner. The statute does not specify what is accurate and valid data, therefore a definition of this term is necessary.

Continuous emissions monitoring (CEM) is conducted with the use of monitors placed directly into the flue gas to measure the gas characteristics. CEMs result in data being recorded nearly instantaneously, either on a stripchart or onto a computer printout. The MPCA requires the use of standard calibration and operation methods promulgated by EPA to ensure that the CEM data is accurate (40 CFR Part 60 Appendix B and F). The accuracy and validity of the data are dependent upon the calibration or certification of the measuring or monitoring equipment, and the adherence to the calibration and operating procedures.

Stack testing is also conducted using standard sample collection and analysis methods promulgated by EPA (40 CFR Part 60, App A, 40 CFR Part 266, Appendix IX). Stack samples are withdrawn from the flue gas to undergo laboratory analysis. The personnel who collected the samples and conducted the laboratory analysis must prepare a report describing the conditions of the facility at the time of testing, difficulties that arose during stack testing, and the calculations used to determine stack emissions. Depending on the analyses required, it make take up to several months to complete sample analysis and report preparation. The reports are submitted to the MPCA by the facility owner.

Stack testing requires trained personnel, and requires a great deal of time, and can quickly become very costly. Because of the number of steps required to obtain results, and the sensitivity of test procedures to errors, unforeseen problems that can arise in the field during the stack tests will affect whether the emissions results are "accurate" or "valid". Stack tests are sometimes subject to human error. The MPCA Air Quality Division has staff dedicated solely to review stack test results to ensure that the tests were completed correctly, and that emissions information was properly determined.

The consequence of not maintaining compliance with the emission limitations for waste combustors is the cessation of operation, a very severe penalty. In order to ensure that this penalty is not applied due to CEM or stack test data improperly characterizing emissions, a standard of when data is determined to be accurate and valid must be established.

For CEM data, data is accurate and valid immediately upon recording. For stack test data, the data will considered accurate 14 days after the waste combustor operator has received the report. A time period is specified to prevent a waste combustor operator from receiving results indicating noncompliance, and not reporting it to the commissioner. The MPCA receives many test reports for review, and has found that staff can determine within several days of the start of review whether the stack testing and data reduction were conducted properly. Because individual facilities do not review reports frequently, it is reasonable to allow the owner/operator a longer time frame to review the results for themselves.

It is possible that during that 14 day review, a condition will be detected that would suggest the data to be inaccurate or invalid. The proposed rule provides the owner/operator an opportunity to notify the commissioner that the data will be rejected by the owner/operator. It is reasonable to allow for this notification, because the MPCA and the facility owner/operator will need to agree as to whether there is in fact an error. If the MPCA determines that there was no error, and the data is accurate and valid showing the facility to be in noncompliance, then the facility has 44 days to remedy the noncompliance (14 days from the time the report was received, plus the allowed 30 days in Minn. Stat. § 116.85 Subd 3 to demonstrate the return to compliance). This is a very limited period of time to conduct whatever repairs might be necessary and conduct a new stack test. The MPCA and the facility owner will need to determine whether modifications of the test are necessary to prevent a similar rejection of data with the retest.

d. Subpart 6. Air Contaminant. This subpart references the definition of "air contaminant" in Minn. Stat. § 116.06 subd. 2. It is reasonable to include the term "air contaminant" in the proposed rule since the rule requires performance tests to be conducted to determine air contaminant emission rates. To avoid duplicating the statutory definition and to promote consistent interpretation of the rules, it is reasonable to reference the statutory definition of the term "air contaminant" in the proposed rule.

e. Subpart 7. Certified Operator. The term "certified operator" is defined as a person who has obtained certification from the state signifying the person's qualification to perform the duties corresponding to the position held. A "certified operator" is the person in direct charge and control of the operation of a combustion system. Individuals whose job descriptions are included under this definition are the chief facility operator, shift supervisor, and operator supervisor.

Due to the complexity of all but the smallest combustors, it is impossible for a single individual to "operate" the entire facility. However, a Class IV combustor may require only one individual to operate it. Therefore, it is reasonable to define the term "certified operator" in a manner such that it may apply to one or more individuals of one or more qualification levels. It is necessary to define the term "certified operator" in the proposed rule to distinguish this person from an "owner or operator" as defined in Minn. Rules 7005.0100 subp. 30 and used in this proposed rule.

f. Subpart 8. Chief Facility Operator. This subpart adopts the definition of "chief facility operator" in federal regulation 40 CFR 60 Subpart Ea. Chief facility operator certification is required by the federal regulations and the proposed rule. It is necessary to define the term "chief facility operator" to identify waste combustor personnel whose duties match those in the definition as a person who is required to obtain certification. It is reasonable to adopt the federal definition of the term to maintain consistency with the federal rules.

g. Subparts 9, 10, 11, 12, 13, 14, 15 and 16. The definitions in Subparts 9 through 16 establish different size categories of waste combustors based on heat input rate of the waste combustor and the date on which a construction permit for a specific combustor was issued. These facilities are defined differently because different standards are imposed on them.

(1) Waste Combustor Capacity

The MPCA proposes to classify waste combustors based on the design heat input rate of the combustor or facility. Heat input is a characteristic that is specific to the combustor, and is the amount of heat that can be put into a system during a specified period of time. Combustion system designers usually specify combustion chamber rated heat input in terms of the amount of heat that can be put into the chamber per period of time (Btu/hr, or KJ/hr). Waste combustor design is based on the heat input rate. The desired heat input rate determines the volume of the furnace, grate area, and the heat absorption area.

The heat supplied to the combustion system during operation is determined by the fuels the system is designed to combust. Fuels are those materials combusted to extract useful heat. Waste combustors use solid waste as their primary fuel, and will typically supplement combustion with a liquid or gaseous fossil fuel.

Fuels are most readily classified by the amount of heat contained in the fuel ("specific heat"). Solid fuels such as coal have a heat content of about 8,000 to 10,000 Btu/lb, fuel oil has a fuel value of about 140,000 Btu/gal, and solid waste can have a fuel value in the range of 4,500 to greater than 10,000 Btu/lb.

The amount of waste a combustion chamber can accept is primarily limited by the specific heat of the fuel. A waste combustor's theoretical charging rate (weight of waste processed per unit of time) can be calculated by dividing the heat input rate of a waste combustor, as determined by its manufacturer, by the calculated or measured specific heat of the waste that is to be combusted. For example, the specific heat of typical MSW in Minnesota has been measured at about 5200 Btu/lb. If a waste combustor has a design heat input rate of 52 million Btu/hr, the theoretical processing rate of the waste combustor is 10,000 pounds per hour of waste. If the same combustor were to combust a waste stream that has a specific heat content of 10,000 Btu/hr (the heat content of typical medical waste), the processing rate of the waste combustor drops to 5,200 lbs/hr. The processing rate of waste varies inversely with the specific heat content of the waste: the higher the content, the less waste can be processed. (In general practice, the charging rate is not constant or even measured as the combustor is operated. For waste combustors from which heat or steam is generated, the charging rate is adjusted to maintain a desired heat production rate.)

By basing the rule on heat input capacity of the waste combustor, rather than charging rate as the existing rules are written, standards are applied to a nonvarying characteristic of the combustor. The capacity of the waste combustor, and applicable standards, would not have be recalculated every time the waste-specific heat content changes, or the operating schedule of the waste combustor changes. Therefore, the proposed rules use the heat input of the waste combustor to determine the size of the waste combustor.

Federal regulation 40 CFR 60 Subparts Ea and Ca apply standards of performance based on the waste processing rate of the waste combustor processing 250 tons per day (TPD). The application of standards based on waste processing capacity was done by EPA in order to comply with CAA requirements to establish emission limits for MWCs with a processing capacity of greater and less than 250 TPD. To provide conversion between weight charging rate and heat input (design capacity) within the municipal waste combustor standards, EPA selected a reference waste-specific heat content of 4,500 Btu/lb. The EPA's charging rate classifications are based on heat input and their reference waste heat content.

The MPCA has chosen not to incorporate the federal method of specifying a reference waste to base the definition of waste combustor capacity. The existing incinerator rules currently classify waste combustors by the amount of waste that is combusted in the unit. This form of classification has been very misleading to incinerator operators in Minnesota. When waste combustors are characterized on the amount of waste that can be charged to the unit, that charging rate becomes the dominant characteristic. Some incinerator operators, particularly those who do not generate heat or steam, have believed that charging rate to be the capacity, regardless of the type of waste being combusted.

This was particularly the case at Minnesota's hospitals. Hospitals often had installed waste combustors to manage pathological wastes, a high moisture, low specific heat value waste (less than 1,500 Btu/hr). As the medical waste stream has grown in the amount of plastics it contains, so has its heat value. However, hospital waste combustor operators continued to charge the waste combustor as if the waste was pathological waste, seriously overcharging the combustor unit.

The MPCA is concerned that continuing to use waste combustor classifications that are based on a weight processing capacity results in the continued focus on weight processing, not on waste as a fuel.

By establishing the classifications of the waste combustors on the heat input for which the combustor was designed, it forces the owner or operator of the source to obtain a better knowledge of the waste stream, and results in better operation of the waste combustor.

For the reasons above, it is reasonable to adopt definitions of waste combustor size based on heat input of the combustor.

(2) Waste Combustor Classes

Adopted federal regulations establish air emission standards for both existing and new MWCs. The definition of existing and new MWCs is provided in federal regulation, and must be incorporated into Minnesota rules. Minnesota's rules must accurately reflect the requirements of the federal regulations so that Minnesota's plan implementing federal regulations is approved by EPA.

EPA established emission guidelines for existing sources based on the total stationary source capacity. For new sources, EPA established emission standards that are based on unit capacity, not total stationary source capacity. This is a result of CAA Sec. 129 (a) which requires standards to be applied to each combustor unit, not the facility as a whole.

To be consistent with the federal requirements, Minnesota's waste combustor rule has been proposed as follows:

- Existing large and very large MWC requirements are based on total stationary source capacity. Existing large and very large waste combustors are defined as Classes A and B. Small existing MWCs are defined as Class C. New waste combustor MWC requirements are based on a waste combustor unit's capacity, not on the facility capacity. New large waste combustor units are defined as Classes I and II.

- It is reasonable to adopt the federal method of regulation and definition of new and existing MWCs to maintain consistency with the federal rules.

- Small waste combustors, less than 15.0 MMBtu/hr (39 tons per day) are regulated as units and are defined as Classes III and IV. These are classified as units to be consistent with Classes I and II and to ensure the regulation of all waste combustors. Class D waste combustors are defined as units larger than 3.0 MMBtu/hr that were in operation before December 20, 1989 and combust wastes other than MSW. EPA is mandated by the CAA to establish standards for sources defined as Classes D, III and IV; however, the date of proposal of these regulations is unknown. Since Minnesota currently regulates these waste combustors, it is reasonable to continue.

(a) **Subpart 9. Class A Waste Combustor.** A Class A waste combustor is defined as a waste combustor facility that burns MSW or RDF with a total design capacity greater than or equal to 400 million Btu/hr for which a construction permit was issued before December 20, 1989. Federal regulation 40 CFR 60 Subpart Ca applies to combustors in this classification of very large municipal waste combustor plants). If a very large MWC was also constructed after June 14, 1984, and generates steam, 40 CFR 60 Subpart Db also applies. Waste combustors in this size range include large power generating stations and municipal waste combustors. Estimates of the heat input rates for the following Minnesota facilities place UPA's generating station in Elk River and HERC's incinerator in Minneapolis in this classification.

This classification of combustor emits the largest quantity of pollutants if the emissions are not highly controlled and monitored. These facilities have the a high potential to impact human health and the environment without these regulations, as indicated in the statement of need. Federal regulations and the proposed rule require a slightly lesser degree of pollution control than Class I waste combustors (which are newly constructed MWC units) of equal size for acid gases. Existing waste combustors have less flexibility than a new facility when modifying the plant to install control equipment, because of existing plant layouts, ease of construction, potential requirements to maintain operation during construction, as well as other unknowns that arise during construction. These difficulties are reflected in the cost of retrofitting pollution control equipment to this group. The MPCA has chosen to propose a slightly different standard for existing facilities in this size range, and must therefore clearly define the facilities to which these standards apply.

Therefore, it is reasonable to classify this type of combustor separately from other classifications of waste combustors.

(b) Subpart 10. Class B Waste Combustor. A Class B waste combustor is defined as a waste combustor facility that burns MSW or RDF with a total design capacity greater than or equal to 93.75 and less than 400 million Btu/hr for which a construction permit was issued before December 20, 1989. Like Class A facilities, federal regulation 40 CFR 60 Subpart Ca applies to combustors in this classification of large municipal waste combustor plants, and 40 CFR Part 60 Subp. Db also applies if the combustor was constructed after June 14, 1984, has a design capacity greater than or equal to 100 million Btu/hr and generates steam. Waste combustors in this classification include large municipal waste combustors and smaller power generating stations. Minnesota facilities of this classification include Northern States Power Company's Wilmarth power generating station in Mankato and its Red Wing generating station.

This classification of combustor emits pollutants with equal potential human health and environmental impact but in smaller quantities than Class A waste combustors.

Federal regulations require of Class B waste combustors the same degree of pollution control, monitoring and testing as a Class A combustor. However, because federal regulations treat these two facilities separately, the MPCA proposes this definition and applicable standards to parallel the federal regulations.

(c) Subpart 11. Class C Waste Combustor. A Class C waste combustor is defined as a waste combustor facility that burns MSW or RDF with a total design capacity greater than or equal to 15.0 and less than 93.75 million Btu/hr for which a construction permit was issued before December 20, 1989. If an incinerator unit in this classification has a charging rate greater than 50 tons per day and was issued a construction permit after August 17, 1971, then federal regulation 40 CFR 60 Subpart E applies to that unit. Waste combustors in this classification include small municipal waste combustors and large industrial or institutional waste combustors. Included in this classification are eight existing municipal waste combustors in Minnesota. These combustors are smaller than the facilities previously discussed. The potential quantity of emissions is correspondingly smaller.

The proposed rule is consistent with the proposed federal regulations for this classification (Federal Register, 54 FR 52250 December 20, 1989). These regulations are to be promulgated in the near future. The proposed rule requires of Class C combustors a lesser degree of pollution control, and less frequent monitoring and testing than a Class A or B combustor. For these reasons, it is reasonable to classify this type of combustor separately from the above discussed classifications.

(d) Subpart 12. Class D Waste Combustor. A Class D waste combustor is defined as a waste combustor unit that burns wastes other than MSW or RDF with a total design capacity greater than or equal to 3.0 million Btu/hr which was in operation on or before December 20, 1989. If an incinerator unit in this classification has a charging rate greater than 50 tons per day and was issued a construction permit after August 17, 1971, then federal regulation 40 CFR 60 Subpart E applies to that unit.

This classification was added to the proposed rule to separate the regulation of municipal waste combustors from industrial waste combustors and medical waste combustors. Class D waste combustors are so small that they do not burn MSW.

These incinerators combust a more homogeneous waste stream (compared to MSW) which consists of materials from manufacturing or processing. Due to the more homogeneous nature and general make-up of the waste stream combusted in these combustors, the average heat value of the waste is higher than that of MSW; approximately 6,000 to 7,000 Btu/lb for typical industrial waste or 10,000 Btu/lb for medical waste versus 4,500 to 5,500 Btu/lb for MSW. The heat release range of this class is approximately 350 and greater.

Currently, incinerators with a charging rate less than 1,000 lb/hr are exempt from the state requirement to obtain an operating permit. In proposing this rule, consideration was given to leaving all sources that are currently exempt from the permitting requirement in a single classification. Review of MPCA Compliance Data System data revealed that there are few incinerators with a charging rate between 350 and 1,000 lb/hr. Further investigation revealed that the use of incinerators in the 350 to 1,000 lb/hr range more closely matches the use of incinerators in the 1,000 lb/hr and larger group, in that some are intermittent or continuously operated waste combustors, may have heat recovery equipment after incinerators, may operate as regional waste combustor facilities (e.g. hospitals accepting wastes from nursing home, veterinary clinics, etc.), or are located at large industrial manufacturing industries.

It is proposed elsewhere in this rule to eliminate the permit exemption for Class D and Class III waste combustors. Some of these waste combustors currently have air pollution control equipment, while other units have none. The MPCA is proposing to impose air emission standards that will require the use of air pollution control equipment. The MPCA will require permits of these facilities in order to specify operating and monitoring conditions at these facilities that is reflective of the equipment used to control emissions.

Therefore, it is reasonable to separate the currently exempt group (less than 1,000 lb/hr charging rate) into two classifications and to classify the higher charging rate portion of the currently exempt group with the larger incinerators.

This classification of waste combustor is too small to be of practical use as a municipal waste combustor. Additionally, these facilities process less waste, so that lesser controls are required to minimize the health and environmental impacts. The proposed rules require of a Class D combustor a lesser degree of pollution control and monitoring and testing than Classes A, B, C, I, II or III. For these reasons, it is reasonable to classify this type of combustor separately from the above discussed classifications.

(e) Subpart 13. Class I Waste Combustor. A Class I waste combustor is defined as a waste combustors unit with a design capacity greater than or equal to 93.75 million Btu/hr for which a construction permit was issued after December 20, 1989. Federal regulation 40 CFR 60 Subpart Ea applies to individual waste combustor units in this classification (units with a charging rate greater than or equal to 250 tons per day). Waste combustors in this classification would include large municipal waste incinerators and power generation stations combusting MSW including refuse derived fuel. Currently, there are no operating waste combustors in this classification in Minnesota; the proposed Dakota County incinerator would be in this classification.

Federal regulations and the proposed rule requires of this classification of combustor the highest degree of pollution control available, and the most extensive continuous monitoring and testing. For these reasons, it is reasonable to classify these combustors separately.

(f) Subpart 14. Class II Waste Combustor. A Class II waste combustor is defined as a waste combustor with a unit design capacity greater than or equal to 15.0 and less than 93.75 million Btu/hr for which a construction permit was issued after December 20, 1989. If a single waste combustor unit in this classification has a charging rate greater than 50 tons per day then federal regulation 40 CFR 60 Subpart E applies to that unit. Class II waste combustors would include new municipal waste combustor units and new industrial or institutional waste combustors units. Currently, there are no waste combustors in this classification in Minnesota.

The proposed definition is consistent with the proposed federal regulations for this classification (Federal Register, 54 FR 52297 Dec. 20, 1989). These regulations are to be promulgated in the near future. Due to the newness of a Class II versus Class C combustor, the proposed rule requires of a Class II combustor a greater degree of pollution control, and the same monitoring and testing schedule as a Class C combustor. For these reasons, it is reasonable to classify this type of combustor separately from the above discussed classifications.

(g) **Subpart 15. Class III Waste Combustor.** A Class III waste combustor is defined as a waste combustor with a unit design capacity greater than or equal to 3.0 and less than 15.0 million Btu/hr that received operating permits after December 20, 1989. This date is established in order to parallel the promulgated federal new source performance standards.

Because Class III units are small, this classification is not expected to include any municipal waste combustors, now or in the future. This classification would include new large medical and industrial waste incinerators, both on-site and commercial. These units potentially could recover heat.

(h) Subpart 16. Class IV Waste Combustor. A Class IV waste combustor is defined as a waste combustor with a design capacity less than 3.0 million Btu/hr. This correspond with a maximum charging rate of approximately 500 lb/hr of a high-paper content waste (6,000 Btu/lb) or approximately 350 lb/hr of medical waste (10,000 Btu/lb). No federal regulations currently apply to this combustor classification; although new federal regulations are planned. The earliest expected date of promulgation is late 1994. Minn. Stat. § 116.801 applies to waste combustors in this classification. This statute allows hospitals to upgrade or install an on-site waste combustor that is planned to manage waste generated primarily by the hospital. Minn. Stat.§116.801 Sec. 1 (b). (1992).

Minnesota facilities that would be classified as Class IV waste combustors include grocery stores and other retail establishments, small commercial/industrial establishments (including metal recovery incinerators), small hospitals and nursing homes. These incinerators usually combust predictable waste streams and are operated intermittently. In the case of grocery and other retail businesses, the waste streams consist mostly of packaging material. In the case of hospitals, the waste streams consist of mostly paper and plastics (Ref. 102).

The proposed rules require of a Class IV combustor the least pollution control and monitoring and testing practical to minimize the impact on human health and the environment. The pollution control required is best described as good combustion practices and consists of operator training and equipment updating and maintenance, as well as careful waste stream management. For these reasons, it is reasonable to classify this type of combustor separately from the above discussed classifications.

(i) Subpart 17. Cofired Unit. A cofired unit is defined as a unit that combusts 30 percent or less by weight of solid waste or RDF along with a fossil fuel. Operators of heat or steam generating equipment are often able to combust a non-typical solid fuel as a supplement to the usual fossil fuel. These non-typical fuels include agricultural wastes, industrial sludges, treated wood wastes, and the like. Fossil fuel co-firing is the practice of combusting fuels extracted from waste along with a fossil fuel, such as coal. In Minnesota, this practice is generally limited to industrial or utility boilers.

Since there are smaller effects from burning small amounts of waste or RDF with fossil fuels, it is the intent of this rule to not disallow the practice. It is necessary to define the point at which a unit that burns waste with a non-waste fuel is defined as a cofired unit so sources that are intended to be regulated by this rule are regulated.

When establishing the threshold, consideration was given to setting the threshold at 20 percent by heat input. This is the threshold established in the Minnesota ash rule 7035.0300 Subpart 67a. By doing so, all cofired units would have been subject to the same ash rules and performance standards. However, for boilers combusting a coal with a high heat value, the proposed rule would have been less stringent than the federal regulations. A 20 percent by heat value is less stringent in this instance because replacing a high heat fuel with a lower heat value fuel requires more of the lower fuel to provide the same amount of heat to the combustion chamber. It is possible to exceed the 30 percent by weight limitation at the federal level if RDF replaces coal with high heat values. This is contrary to the CAA, federal regulations, and current state law.

Another approach would have been to write the rule as follows: any unit burning 20 percent or less by heat input or 30 percent or less by weight of fuel burned, which ever is less, of solid waste or RDF is defined as a cofired unit. This would have complied with the federal regulations have but would still require owners of facilities which cofire their boilers to do two sets of calculations; one to determine input by heat and one by weight. This approach would unnecessarily complicate the rule. Therefore, to maintain consistency with the federal requirements, it is reasonable to adopt the federal cofired unit threshold.

(j) Subpart 18. Crematorium. Crematoria are regulated under this proposed rule. This subpart references the definition of crematorium in Minnesota's Department of Health rules, to provide consistent interpretation of this term.

(k) Subpart 19. Design Capacity. It is necessary to provide a definition of the term "design capacity," since it is used in the determination of the size of a facility and therefore, the classification of a waste combustor and the requirements to which a combustor must comply. It is reasonable to base the definition of the term on heat input since heat input is the factor around which waste combustors are designed and operated and the proposed rule is written.

(l) Subpart 20. Dumpstack. The term "dumpstack" is defined as any opening functionally equivalent to a chimney, stack or vent by which uncontrolled emissions are vented to the ambient air. It is necessary to define the term "dumpstack" since many waste combustors have them and the conditions under which their use is allowed is regulated. A dumpstack on a waste combustor is typically located immediately after the combustion chamber and before the waste heat recovery units and pollution control equipment. When the dumpstack is in use, the combustion gases are vented directly to the atmosphere without passing through the air pollution control equipment. It is reasonable to define the term to be broadly inclusive so as to prevent the unregulated use of dumpstacks.

(m) Subpart 21. Energy Recovery Facility. The proposed rule will regulate facilities that recover energy from waste. Minn. Rules 7035.0300 defines the term "energy recovery facility" for its use in solid waste management rules. The definition of the term "energy recover facility" is redefined for this rule to specifically exclude landfills, which recover methane. The definition also excludes the facilities that collect the fuel or manufacture the refuse-derived fuel from the facilities that burn the waste or RDF to produce heat, electricity or steam. In order to apply the appropriate standards of performance for energy recovery facilities, a definition must be provided. It is reasonable to redefine this term to ensure that landfills and waste processing facilities are not regulated under this rule.

(n) Subpart 22. Fluidized Bed Combustor. A fluidized bed combustor is a combustion system that employs a heated bed of material. The bed is maintained in a fluidized state by forcing air through the material from below. Combustion of solid waste occurs in the bed. Fluidized bed combustors typically burn processed fuel or RDF. It is necessary to define the term "fluidized bed combustor" since carbon monoxide emissions vary according to the combustion system employed. Specific federal emission limits have been promulgated for fluidized bed combustors (40 CFR 60 Subpart Ea, Table 1). In order to maintain consistency with the federal regulations, the same emission limits are proposed in this rule.

(o) Subpart 23. Forensic Science Laboratory. It is reasonable to define forensic science laboratory in the rule because forensic science laboratory waste combustors are exempt from the prohibition on Class IV waste combustors.

(p) **Subpart 24. Four Hour Block Average.** This subpart adopts the definition of "four hour block average" in federal regulation 40 CFR 60 Subpart Ea. Emission limits are established using averaging periods which are the length of time over which the measured emission concentration is averaged. In order to consistently apply emission limits and determine compliance, a consistent averaging period is required. Therefore, it is necessary to define the averaging period to be used when compliance is to be determined. It is reasonable to adopt the federal definition to maintain consistency with the federal regulations.

(q) **Subpart 25. Hazardous Waste.** This subpart references the definition in Minn. Stat. § 115B.02, subd. 9 of "hazardous waste." It is necessary to define the term "hazardous waste" since burning it is prohibited unless specifically permitted. To promote consistent interpretation of the rules, it is reasonable to reference the existing definition of the term "hazardous waste" in the proposed rule.

(r) **Subpart 26. Household Batteries.** This subpart references the definition in Minn. Stat. § 115A.961 of "household batteries." It is necessary to define the term "household batteries" since the proposed rule requires management plans to remove household batteries and other mercury containing waste before the waste is combusted. To promote consistent interpretation of the rules, it is reasonable to reference the existing definition of the term "household batteries" in the proposed rule.

(s) **Subpart 27. Household Hazardous Waste.** This subpart adopts the definition in Minn. Stat. §115A.96 subd. 1 (b) of "household hazardous waste." Examples of household hazardous waste include: latex paints, oil-based paints, used motor oil, aerosol products and moth balls. It is necessary to define the term " household hazardous waste" because Minn. Stat. § 116.07 subd. 4k requires the owner or operator of a municipal waste combustor to submit a plan for the separation of household hazardous wastes from the waste stream. The proposed rule requires the preparation and submittal of this plan to the MPCA. To promote consistent interpretation of the rules, it is reasonable to reference the statutory definition of the term "household hazardous waste" in the proposed rule.

(t) Subpart 28. Incinerator. This definition has been modified slightly from the definition currently in the rules. The proposed definition will include the terms "emissions unit" and "emission facility" to correspond with the applicable federal rule term "emissions unit" and the state statutory term "emission facility." Under the current definition, it was unclear if "incinerator" meant a single incinerator unit combusting waste, or whether it meant the entire facility. Current standards of performance apply to an "incinerator". For waste combustor facilities with multiple units, it would have been unclear whether the standard of performance applied to a single facility, or the whole plant.

(u) Subpart 29. Industrial Solid Waste. This subpart references the definition in Minn. Rules pt. 7035.0300 subp. 45 of "industrial solid waste." A definition of this term is needed because the proposed rule requires the waste combustor owner or operator to submit a plant to handle the industrial solid waste. A plan is required because industrial solid waste is a unique waste category with unique handling problems. To promote consistent interpretation of the rules, it is reasonable to reference the existing definition of the term "industrial solid waste" in the proposed rule.

(v) Subpart 30. Infectious Waste. This subpart references the definition in Minn. Stat. § 116.76 subd. 12 of "infectious waste." A definition of this term is needed because waste combustor owners and operators who handle infectious waste are required by solid waste rules to submit to the MPCA a plan to handle the waste. A plan is necessary because infectious waste is a unique waste with very special handling problems. To promote consistent interpretation of the rules, it is reasonable to reference the existing definition of the term "infectious waste" in the proposed rule.

(w) Subpart 31. Initial Start-Up. Initial start-up is defined as the date on which solid waste is first fired. Since initial start-up is the event which triggers the applicability of the standards of performance, it is necessary to define the term "initial start-up" in the proposed rule. This definition clarifies the point at which testing and reporting requirements become effective for newly constructed, modified or reconstructed waste combustors. After initial installation, components of waste combustors are sometimes operated to test the equipment relative to the design expectations. These tests can be conducted on fossil fuels. Since operating with fossil fuels does not trigger the rule requirements, it is reasonable to define the initial start-up as the event during which waste is first fired and not when the unit is first fired with fossil fuel.

(x) Subpart 32. Mass Burn. A mass burn waste combustor is a combustion system that is field-erected and combusts waste that has not been subjected to shredding or size classification (for example RDF). Combustion occurs in a single furnace instead of separate chambers. It is necessary to define the term "mass burn" since emissions vary according to the combustion system employed. State and federal carbon monoxide emission limits have been proposed and promulgated for specific combustion systems (40 CFR 60 Subpart Ea, Table 1 and 7011.1227, Table 1). State mercury emission limits (7011.1227, Table 1 and 7011. 1229, Table 2) have also been proposed for specific combustion systems. To promote consistent interpretation of the rule and assist the applicant in determining the correct emission limit for the combustion system for which an application is submitted, it is reasonable to define the term "mass burn" in this rule.

(y) Subpart 33. Maximum Demonstrated Capacity. "Maximum demonstrated capacity" is used to define the permissible range of operation without additional testing. Therefore, it is necessary to define the term. The term "maximum demonstrated capacity" is defined as the maximum average load achieved during the most recent test during which the PCDD/PCDF emission limit was achieved. "PCDD/PCDF" is defined in proposed subp. 40. This is the same definition given to the federal term "maximum demonstrated MWC unit load." Since the federal term applies only to municipal waste combustors and the proposed rule will apply to other types of waste combustors, another term must be used. For this reason, it is reasonable to define the term "maximum demonstrated capacity" such that it can be applied to facilities other than municipal waste combustors.

(z) Subpart 34. Metals Recovery Incinerator. The term "metals recovery incinerator" is defined as a furnace or incinerator used for the recovery of metals by burning the combustible fraction of components which contain metal. The primary purpose of this type of incinerator is for recovery of a material instead of waste volume reduction, it is necessary to define the term. Since this type of incinerator is included in the definition of a waste combustor, it is reasonable to define the term "metals recovery incinerator" to make clear that this type of incinerator is to be regulated as a waste combustor.

(aa) Subpart 35. Mixed Municipal Solid Waste. This subpart adopts the definition in Minn. Stat. § 115A.03 subd. 21 of "mixed municipal solid waste." Since a large portion of the proposed rules apply to combustors that burn this type of waste, it is necessary to define the term "mixed municipal solid waste" in the proposed rule. To promote consistent interpretation of the rules, it is reasonable to reference the statutory definition of the term "mixed municipal solid waste" in the proposed rule.

(bb) Subpart 36. Modular Waste Combustor. A modular waste combustor is a combustion system that is not erected in the field and consists of two or more chambers for the combustion of solid wastes and gases formed from the waste. It is necessary to define the term "modular waste combustor" since emission limits vary according to the combustion system employed. State and federal carbon monoxide emission limits that have been proposed and promulgated differ for specific combustion systems (40 CFR 60 Subpart Ea, Table 1 and 7011.1227, Table 1). State mercury emission limits (7011.1227, Table 1 and 7011.1229, Table 2) have also been proposed for specific combustion systems. To promote consistent interpretation of the rule and to assist the applicant in determining the correct emission limit for the combustion system for which an application is submitted, it is reasonable to define the term "modular waste combustor" in this rule.

(cc) Subpart 37. Normal Start-Up. The term "normal start-up" is defined as that period of time between initial start-up (firing waste for the first time) and the lessor of the 60 to 180 day window established by federal regulations for performance testing for facilities to which federal standards apply. Since the term is also used in the proposed rule to trigger applicability for Minn. Stat. § 116.85, subd. 2 and 3, it is necessary to provide a definition.

The proposed definition of "normal start-up" incorporates the definition currently in use in Federal regulation 40 CFR 60.2 which defines "start-up" as the setting in operation of an affected facility for any purpose and Federal regulation 40 CFR 60.8 (a) which establishes when performance tests must be conducted:

Within 60 days after achieving the maximum production rate at which the facility will be operated, but not more than 180 days after initial start-up of such facility and at such other times as may be required by the Administrator under Section 114 of the [Clean Air] Act, the owner or operator of such facility shall conduct performance test(s) and furnish a written report of the results of such performance test(s).

Minn. Stat. § 116.85, subds. 2 and 3 do not define the term "normal start-up" but provide as follows:

> **Subd. 2. Continuously monitored emissions.** Should, at any time after normal start-up, the permitted facility's continuously monitored emissions exceed permit requirements, based on accurate and valid emissions data, the facility shall immediately report the exceedance to the commissioner and immediately either commence appropriate modifications to the facility to ensure its ability to meet permitted requirements or commence shutdown if the modifications cannot be completed within 72 hours. Compliance with permit requirements must then be demonstrated based on additional testing.

> **Subd. 3. Periodically tested emissions.** Should, at any time after normal start-up, the permitted facility's periodically tested emissions exceed permit requirements based on accurate and valid emissions data, the facility shall immediately report the exceedance to the commissioner, and the commissioner shall direct the facility to commence appropriate modifications to the facility to ensure its ability to meet permitted requirements within 30 days, or to commence appropriate testing for a maximum of 30 days to ensure compliance with applicable permit limits.
>
> If the commissioner determines that compliance has not been achieved after 30 days, then the facility shall shut down until compliance with permit requirements is demonstrated based on additional testing. (Minn. Stat. § 116.85 subds. 2, 3 (1992))

The statute is intended to provide a period of exemption from the requirements for testing and testing's consequences after the initial facility start-up. This period of exemption would allow the "debugging" of the system before the shut down statute applies. The statute is also intended to ensure that waste combustors exceeding the emissions limits during normal operations are shut down for repairs.

Since the term is used in the proposed rule and the statute, it is necessary to define "normal start-up." Since Classes I, II, A, B, and C waste combustors are affected by these federal requirements, it is reasonable to continue using the time period established by federal requirements in Minnesota's regulatory program. Once a new, modified or reconstructed facility reaches the point at which normal start-up ends, the shut down provisions of Minn. Stat. § 116.85 apply. It is necessary to identify the period of normal start-up, and reasonable to be consistent with the federal requirements.

The time period defined in federal regulations is applied to all waste combustors in order to provide a consistent application and interpretation of the term "normal start-up".

(dd) Subpart 38. Operator Supervisor. Operator supervisor is defined as the Class IV waste combustor personnel who is directly responsible for the control of the operation of the waste combustor and is responsible for overall on-site supervision. This person may or may not be the person feeding waste into the waste combustor. It is necessary and reasonable to define the term "operator supervisor" to identify Class IV waste combustor personnel who are required to obtain certification.

(ee) Subpart 39. Paint Burn-Off Oven. This subpart provides a definition for a paint burn off oven. When manufacturers paint their products, the products are often suspended from hooks and other accessories during the painting process. The hooks and accessories are cleaned by burning the paint off in a paint burnoff oven. These emission units are not designed to combust waste. A fossil fuel must be used to combust the paint. The standards of performance for incinerators, and this proposed rule are not intended to apply to paint burn off ovens, although there has been confusion in the past in the regulated industry. It is reasonable to provide this definition in order to clearly state that the waste combustor standards of performance do not apply to paint burn off ovens, and to ensure consistent interpretation of the term.

(ff) Subpart 40. Pathological Waste. This subpart references the definition in Minn. Stat. § 116.76 subd. 14 of "pathological waste." It is necessary to provide a definition of this term in the proposed rule because pathological waste is a unique waste category with unique handling problems.. To promote consistent interpretation of the rules, it is reasonable to adopt the statutory definition of the term "pathological waste" in the proposed rule.

(gg) Subpart 41. Polychlorinated Dibenzo-p-dioxins, Polychlorinated Dibenzofurans (PCDD/PCDF). This subpart adopts the federal definition of Polychlorinated Dibenzo-p-dioxins, Polychlorinated Dibenzofurans (PCDD/PCDF) in federal regulation 40 CFR 60 Subpart Ea. PCDD/PCDF is defined as the tetra- through octa- species of the dioxin/furan family. It is necessary to provide this definition to identify the air contaminants for which air emission limitations have been proposed in this rule. It is reasonable to adopt the existing federal defintion because it clearly identifies the targeted dioxins and furans.

(hh) Subpart 42. Problem Materials. This subpart references the definition in Minn. Stat. § 115A.03 subd. 24a of "problem materials." A definition of this term is needed because the proposed rule requires, when submitting a permit application for a waste combustor, the identification and quantification of problem materials in the waste stream. To promote consistent interpretation of the rules, it is reasonable to reference the statutory definition of the term "problem materials" in the proposed rule.

(ii) Subpart 43. Refuse-Derived Fuel. This subpart references the definition in Minn. Stat. § 116.90, subd. 1, paragraph (c) of "refuse derived fuel" or "RDF." A definition of this term is needed because the proposed rules establish emission limits that are unique to combustors that burn RDF and those combustors require unique planning and testing. To promote consistent interpretation of the rules, it is reasonable to reference the statutory definition of the term "refuse-derived fuel" or "RDF" in the proposed rule.

(jj) Subpart 44. Shift Supervisor. This subpart adopts the definition of "shift supervisor" in federal regulation 40 CFR 60 Subpart Ea. Shift supervisor certification is required by the federal regulations and the proposed rule. It is necessary to define the term "shift supervisor" to identify waste combustor personnel whose duties match those in the definition as a person who is required to obtain certification. It is reasonable to adopt the federal definition of the term to maintain consistency with the federal rules.

(kk) Subpart 45. Solid Waste. This subpart references the definition in Minn. Stat. § 116.06, subd. 10, of "solid waste." Since the proposed rule permits the combustion of only certain types of waste, of which solid waste is one, it is necessary to define the term "solid waste." To promote consistent interpretation of the rules, it is reasonable to reference the statutory definition of the term "solid waste" in the proposed rule.

(ll) Subpart 46. Waste Combustor. A "waste combustor" is defined as any stationary source, emissions unit, or emission facility that burns waste or RDF. This is a new term, developed in order to provide a single term for many different types of equipment used to combust waste, and the many different waste combustor uses. Waste combustors are also known as waste-to-energy facilities, energy recovery facilities, incinerators, resource recovery facilities, garbage burners and so on. The generic term "waste combustor" is proposed to make clear the point that this rule applies to any waste combustion system whether it is used for energy recovery or solid waste management. The term "waste combustor" is intended to focus on the fact that waste is the fuel used in the combustion system, rather than the use to which a combusting system is put, i.e. incineration, steam or power generation.

EPA has used this term in the federal regulations governing MSW combustors (40 CFR 60 Subparts Ea and Ca). It is reasonable to adopt this term to maintain consistency with the federal rules.

Soil roasters are specifically excluded from this definition. These facilities are operated to combust very light petrochemical contaminants in soil from leaks and spills of gasoline or diesel fuel. The roasters are designed and operated more similarly to asphalt plants than waste combustors. However, because this activity is often referred to as soil incineration, there was some confusion by operators of soil roasters about the applicability of these rules. The MPCA will continue to permit the soil roasters according to the standards of performance for direct heating sources (7011.0600 to 7011.0620).

It is proposed to not regulate wood heaters as described in 40 CFR 60 Subpart AAA and fireplaces under this rule. While homeowners may use these facilities for waste disposal, the overall quantity of waste disposed of is insignificant. Also, it would require a huge commitment of MPCA resources to locate and permit wood stoves and fireplaces.

This subpart also states that a class D waste combustor that was burning more than 30 percent by weight of RDF on January 1, 1991 shall comply with the applicable standards of performance in parts 7011.0500 to 7011.0551 or 7011.0625 for equipment burning solid waste.

The Minnesota Legislature enacted Minn. Stat. 116.90 in order to promote the combustion of RDF in boilers and other solid fuel-fired units. This statute requires the MPCA to regulate those facilities which combust up to 30 percent by weight of RDF as facilities other than as waste combustors, but does not prevent the MPCA from choosing to exempt users of higher amounts of RDF from being regulated as waste combustors.

An exemption has been provided for Class D waste combustors that have in the past been combusting RDF in the proposed rule in order to allow two facilities in Minnesota that combust 100 percent RDF to be regulated under the conditions of indirect or direct heating source standards of performance. This exemption is provided, because without it, the units would be regulated as waste combustors. The MPCA expects that if these units were regulated as waste combustors, their owners would cease the combustion of RDF. The RDF is produced by a small business in Minnesota, and has only these two customers currently purchasing this fuel. If these units ceased the use of RDF, the RDF producer would likely have to cease operating. This is clearly not the intent of the Legislature.

The expansion of combusting more than 30 percent RDF is precluded, however. Combustion of RDF results in higher emissions of lead and mercury from these units than if they were burning coal or wood. Because one of the intents of regulating the combustion of RDF or MSW is to ensure that mercury emissions are minimized, the MPCA does not propose to allow the expansion of RDF combustion without proper permitting and controls.

For the reasons stated above, it is reasonable to exclude soil roasters, wood heaters, and fireplaces, and Class D waste combustors combusting RDF on January 1, 1991, from the effects of this rule. It is necessary to define the term "waste combustor" to assist the regulated community in determining the applicability of the proposed rule. It is also reasonable to use the federal term in the proposed rule to maintain consistency with existing regulations.

(mm) Subpart 47. Waste Tire. This subpart references the definition in Minn. Stat. §115A.90, subd. 11, of "waste tire." It is necessary to define "waste tires" since the proposed rule restricts their combustion. To promote consistent interpretation of the rules, it is reasonable to reference the statutory definition of the term "waste tire" in the proposed rule.

(nn) Subpart 48. Wood Heater. This subpart adopts the federal definition of "wood heater" as defined in 40 CFR 60 Subpart AAA. Wood heaters are exempt from permitting under the rule. The intent of exempting them from the proposed rule is to eliminate residential wood stoves from the permitting process. While these may be used to combust waste, the amount of waste that could be combusted in a wood heater as defined in the NSPS is negligible when compared to the total amount of waste combusted in Minnesota in permitted waste combustors and the task of permitting all wood stoves in Minnesota would be overwhelming. However, it is not the intent of the proposed rule to exempt from the permitting process a waste combustor that the owner or operator calls a wood stove. Therefore, it is necessary to define the term "wood heater" and it is reasonable to adopt the federal definition.

(oo) Subpart 49. Yard Waste. This subpart adopts the definition in Minn. Stat. § 115A.931 (b) of "yard waste." It is necessary to define "yard waste" since the proposed rule prohibits its combustion, unless approval is obtained from the commissioner. Yard waste under statute 115A.931 must be managed by other means. To promote consistent interpretation of the rules, it is reasonable to adopt the statutory definition of the term "yard waste" in the proposed rule.

4. Reasonableness of Part 7011.1205--Incorporation By Reference

This is a new part which establishes the incorporation of references used in Minn. Rules pts. 7011.1201 to 7011.1285. Minn. Stat. § 14.07, subd. 4. requires that references to text publications and documents be incorporated into a rule, and the availability of the text identified for the reader. This part thus identifies for the reader that certain reference documents are used within Minn. Rules pts. 7011.1201 to 7011.1285, and where these documents are available.

5. Reasonableness of Part 7011.1210--Notification Required of Class IV Waste Combustors

Class IV waste combustors are defined in proposed part 7011.1201 subp. 16. as waste combustors with a heat release rate of up to 3.0 million Btu/hr. These units are capable of processing up to about 300 pounds per hour of medical waste, and about 667 pounds per hour of animal carcasses or other high-moisture content waste.

Existing permit rules exempt incinerators with a maximum refuse burning capacity of less than 1000 pounds per hour or facilities with potential emissions of a single criteria pollutant of less than 25 tons per year from obtaining a permit. Minn. Rules pt. 7001.1210, subp. 2(A) and (G) (1991). In order to comply with the requirements of the 1990 Clean Air Act amendments, the MPCA has undertaken revising these rules. This revision process is referred to as the "operating permit program", and must be reviewed and approved by EPA before the MPCA can implement the federal permitting program. The new rule will establish "federal" permits (Part 70 permits for sources defined as "major" sources, or sources specifically required to obtain a federal permit), and "state" permits. The operating permit rule will be effective for issuing state permits upon adoption by the MPCA. Federal permits, however, will not be issued until EPA approves the program.

Under Section 129 of the Clean Air Act, EPA is directed to establish air emission standards for waste combustors of all types. Section 129 (e) states that when the standards are promulgated, the facilities to which the standards apply must obtain a federal permit. Until that point, states are free to choose to permit such sources.

However, in 1991 the Minnesota Legislature required permits for medical waste incinerators that combust more than 350 pounds per hour. Minn. Stat. 116.801 (b) (1992). The MPCA has proposed to enlarge upon this permit requirement by establishing permit requirements for all waste combustors above this size, as described in the statement of reasonableness for part 7011.1220.

Waste combustors not banned under 7011.1220 and not exempted from permitting that are below this size are proposed to be governed by notification rather than by permit. These waste combustors will be known as Class IV waste combustors. Class IV waste combustors will not be required to obtain an air emission permit, but are required to notify the MPCA of the installation of the waste combustor, and to demonstrate compliance with the air emission standards of performance.

Because at some point in the future these facilities may need to obtain a federal permit if EPA promulgates emission limits for these various waste combustors, the MPCA needs to keep record of the waste combustor owners and operators. Therefore, the MPCA is proposing that Class IV waste combustors provide notification via the process described in this part. If all the conditions of the notification are met, the facility may commence construction or operation.

It is not reasonable to require a written permit for Class IV waste facilities at this time. The environmental impacts of these small waste combustors can be substantially reduced by employing good combustion operating practices, including having trained operators, ensuring that waste combustors do not burn certain prohibited wastes, installing good combustion equipment, and having stack heights that reduce ambient air quality impacts. These requirements are specified in the proposed standards of performance, and when in place, will reduce the waste combustors' potential for environmental harm significantly. Specific permit requirements are not necessary to achieve the reductions.

Owners and operators of Class IV waste combustors are usually small businesses as defined by Minnesota Statute 14.115 (1992). This statute requires the MPCA to consider means of reducing the impact of the rules on small businesses. One means of lessening the impact of the rules is to consider less burdensome means of permitting. The notification system significantly lessens the impact of the rules for these small facilities because it exempts the facilities from the complicated and often expensive process of obtaining a permit. It does not compromise the MPCA's intent of reducing air emissions from small waste combustors.

The MPCA also considered limiting permit requirements to only new or upgraded waste combustors, in order to lessen the impact of the regulation on small waste combustor owners. The MPCA chose not to pursue this scheme of permitting. The goal of this rule making activity is to promote the use of new and better equipment at all waste combustor sites. Grandfathering existing incinerators would only encourage the continued use of outmoded incinerators over newer equipment that can reduce emissions with good combustion practices.

This part describes the information a Class IV owner/operator must submit to the commissioner to operate without a written permit. The waste combustor owner or operator must submit a notice to the commissioner, and must supply sufficient information so that the MPCA can review the facility, and determine whether the waste combustor is in compliance with the requirements of parts 7011.1201 to 7011.1285.

Although the intent of this rule is to relieve Class IV waste combustors of the burden of obtaining a written permit, Class IV owners or operators will still be required to comply with the statutory requirements for permit holders. The MPCA does not have authority to create exemptions from statutory requirements.

Item A. Item A requires that the notification contain the name of the owner and operator, and the address of the waste combustor installation. This information identifies who has the responsibility for compliance with the terms of the rules.

Item B. Item B requires that the notification contain a schedule showing how waste combustors operating on the effective date of the standards of performance will be brought into compliance. Class IV waste combustors are required by proposed part 7011.1215, Subp. 5 to be in compliance with the standards of performance two years after the effective date of the standards, or if a permit was issued after December 1992, at the expiration of that permit. The Class IV waste combustor owner must submit a schedule with the notification showing that the waste combustor will be in compliance by that date. If the waste combustor is not in compliance by that date, the Commissioner has grounds for enforcement action including an order to cease to operate. A schedule is reasonable to allow both the MPCA and the operator to track the facility's progress toward compliance.

Item C. Item C requires the results of a fractional analysis of the waste, and the waste's heat value. This information is generated by the waste combustor owner or operator when the selection of the waste combustor is made, and is required so that the MPCA can ensure that the waste combustor owner and operator and the incinerator equipment supplier have properly chosen equipment suitable for the waste. Improper waste characterization is one of the key causes for incinerator malfunction and excess emissions (Ref. 103). MPCA enforcement personnel during inspections of small on-site waste combustors note frequently that wastes which have high heating values are frequently being overloaded.[9] If equipment and design loading rates are appropriate, then it is more likely that emissions will be properly controlled. This item also allows published information to be used to determine the heat value of the waste stream. This will allow a waste combustor to determine the heat value of the waste stream without contracting with a laboratory to develop a waste stream heat value. It is reasonable to provide a fractional analysis and heat value to the MPCA so that the MPCA can ensure that design loading rates are appropriate.

Item D. Item D requires the name and model number of the waste combustor, stack diameter and height. The manufacturer's name and model number provides essential physical identification of the equipment, and will allow MPCA inspectors to ascertain that the equipment installed and operated was the same equipment the MPCA reviewed from the owner/operator's notification. Providing the stack diameter and height of the incinerator is necessary to determine

9 Conversation between Mr. Todd Biewen of the MPCA and Ms. Anne Jackson of the MPCA.

whether the waste combustor meets the minimum stack height requirements of proposed part 7011.1235.

Item E. Item E requires that the application contain the design capacity of the waste combustor in million Btu's per hour. This information is necessary to determine the applicable standards of performance for the waste combustor, which then determines whether the facility requires an air emissions facility permit, or merely needs to notify the Commissioner of the waste combustor installation.

Item F. Item F requires that the applicant submit a mercury waste separation plan that is in accordance with proposed part 7011.1255. This part requires that a permit applicant separate wastes which contain mercury before the wastes are combusted. Unlike most other metals, mercury is very volatile and is not controlled by establishing particulate matter limits as surrogate metal emission limitations. Nearly all the mercury found in the waste burned at Class IV facilities will be emitted via flue gases, and will not be found in the ash that remains.

As solid waste disposal costs increase, it is expected that waste generators will use waste combustion to control those costs. To control mercury emissions from waste combustors, the waste combustor operator must prepare a plan that eliminates wastes with mercury from the wastes that will be combusted. Further, Minn. Law ch. 560 (1992) prohibits putting specified wastes that generally contain mercury in solid waste streams.

Proposed part 7011.1255 requires that the waste combustor at a minimum prepare a plan that addresses the largest sources of mercury in the waste stream: batteries, electrical devices and switches, electric lighting components, and solid wastes from laboratories where mercury is used. It is reasonable to require a plan so that the owner/operator has the flexibility to design their own system and so that the MPCA can determine whether the owner/operator will achieve compliance with the statutory prohibitions.

Item G. Item G requires that the waste combustor owner or operator submit a plan that describes how the owner or operator will dispose of ash. Minn. Stat. 116.07 Subd. 4j (b) requires the MPCA to require as a condition of a waste combustor permit application identification of plans for ash management. The MPCA will review this information to ensure that ash is properly managed. If the ash is sent to MSW landfills, the MPCA will review the ash plan to ensure that the ash is tested in accordance with the landfill's industrial waste management plan, or managed otherwise (i.e. sent to a MSW ash monofill).

Item H. Item H requires that a performance test report with the results of a stack test be submitted. The waste combustor must demonstrate compliance with the air emission standards or cease operation under Minn. Stat. 116.85 Subd. 3. A waste combustor that does not meet the emission limitations does not meet the conditions to be exempted from obtaining a written permit. The MPCA requires a performance test in order to ensure that the waste combustor meets the standards of performance. MPCA staff are often present during stack tests.

For new Class IV waste combustors, the performance test report is due 180 days after the Commissioner is notified of the installation of the combustor. This ensures that the Commissioner is notified of the waste combustor installation prior to conducting the performance test and that compliance testing is conducted on the waste combustor. If no compliance test is submitted, the Commissioner has grounds to order the cessation of the operation of the incinerator under Minn. Stat. § 116.85.

It is reasonable to require performance test results to determine compliance status.

Item I requires that the owner or operator certify that the information was prepared under supervision by qualified individuals, and the information is true, accurate and complete. The owner or operator must also certify that the waste combustor meets the applicable requirements of parts 7011.1201 through 7011.1285. It is reasonable that the waste combustor owner certify that the information is accurate and that the facility complies with the rule requirements, because it provides the MPCA and the public an elevated level of confidence in the information and there is reasonable assurance that the waste combustor meets the conditions of the rule.

6. Reasonableness of Part 7011.1215--Applicability of Standards of Performance for Waste Combustors

This part addresses to whom these standards apply, and how quickly existing facilities will need to come into compliance with the standards.

a. Subpart 1. Waste Combustors. This subpart has been proposed in the rule in order to clearly state which types of stationary sources are subject to the proposed standards of performance. It is reasonable to inform existing and prospective waste combustor owners and operators of which facilities must comply with these proposed standards.

The proposed rules address emissions from all waste combustors, to eliminate the ongoing use of poor incinerators, ensure installation of good incineration equipment, and ensure proper operation of the facility. No grandfathering of existing facilities is provided in the proposed rule. As presented in the need portion of this SONAR, the emission limitations in the current rules are inadequate to protect the environment.

b. Subpart 2. Co-Fired Facilities. This subpart states that a unit that meets the requirements for a co-fired unit is not defined as a waste combustor and, therefore, is not subject to the requirements of this rule. Co-fired units shall comply with the requirements for direct and indirect fired boilers as provided by Minn. Stat. § 116.90, subd. 2(c). It is reasonable to state this provision of the statutes in the proposed rule.

c. Subpart 3. Exemption from Standards of Performance. The MPCA has chosen not to impose the standards of performance on four groups of waste combustor operators, due to their very specialized application, and their low potential for air pollution, if certain operating standards are met.

Human crematoria are used for the disposition of human body parts. The crematoria are licensed with the Minnesota Department of Health, and are inspected according to that agency's resources and goals. These waste combustors are designed for a very specific purpose, and are used as an alternative to direct burial. Pathological waste combustors are used throughout Minnesota at research facilities, veterinary, medical and biology schools for the disposal of pathological waste from both humans and animals. These waste combustors, as well as incinerators used on farms for disposing of animal carcasses, combust waste that is primarily moisture. The waste combustors fall into Class IV, and emit very small quantities of pollutants.

The MPCA is proposing to ban most Class IV waste combustors in this rule making, due to their general condition, the high cost of upgrading, the availability of alternative waste disposal methods, and the MPCA's inability to regulate an additional 1300 waste combustor facilities. However, alternatives to crematoria, pathological waste, and animal carcass disposal are few. The MPCA therefore chose not ban these waste combustors.

The emissions from pathological waste incinerators were measured by EPA (Ref. 104). These waste combustors emit very low concentrations of metals, particulate matter and dioxins than waste combustors of this size combusting medical waste, and therefore do not require control requirements as are being placed on medical waste incinerators. In order to prevent the operation of these facilities from becoming a nuisance, operating conditions are imposed on these waste combustors.

These conditions are described in items A to C.. Item A imposes an opacity standard on the operation of the units in order to prevent their operation from causing nuisance conditions. Compliance with this standard is achieved by operating an afterburner in the stack. Item B requires the installation of an afterburner that maintains flue gases at 1200 degrees F for at least 0.3 seconds to achieve the 20 percent opacity limit, which is contained in the existing standards of performance for incinerators. Item C requires that ash be stored and transported to prevent avoidable amounts of particulate matter to become airborne. This is a restatement of part 7011.0150 which restricts the emissions of fugitive particulate matter. This work practice standard is not more prescriptive because the final disposition of the ash is different at the different facilities. The work practice standard is proposed to prevent nuisance conditions from ash.

It is reasonable to require sufficient controls to prevent nuisance conditions at exempt facilities. The controls proposed will prevent nuisance conditions and are not burdensome.

d. **Subpart 4. Emission Standards.** This subpart states when the emission standards apply. Under 40 CFR 60.8 (c), new source performance standards (NSPS) apply at all times, except during start-up, shutdown, and malfunction. The federal municipal waste combustor NSPS placed a limit on the length of time that these occurrences are exempt from emission limitations. The time limitation for startup and shutdown activities at a waste combustor establishes the point at which emission limits are to apply. By specifying a time limitation, unreasonably long periods of operation at elevated emission levels are prevented, because at the end of that startup period, if emissions are exceeded, the facility is subject to the shutdown provisions of part 7011.1260, subp. 7 (continuous monitoring) and 7011.1265, subp. 10 (performance tests). The specification of a time limit most practically applies to continuously monitored emissions, because these monitors will be operating during periods of startup, shutdown and malfunction of a waste combustor unit.

In EPA's response to public comments, EPA explained its rationale for setting the three hour time limit in the MWC NSPS and emissions guidelines. EPA considered how long it would reasonably take to correct the types of malfunctions that may occur at MWC's. Most new (and existing large MWC's in Minnesota) will use spray dryers and fabric filters for control equipment. Due to the configuration of these control systems, most repairs and maintenance can be performed on-line. For example, a rotary atomizer or spray nozzle in the spray dryer can be replaced in less than 3 hours. If a bag failure occurs, the compartment containing the failed bag can be isolated and taken off-line for repair without requiring complete shutdown of the waste combustor unit. (Ref. 105).

It is reasonable to establish a time limitation to prevent prolonged startup or shutdown operations, or malfunctions without correcting the causes of the exceedance.

The MPCA considered whether to apply this time limitation to Class III and D waste combustors. Class III and D waste combustors are located at industrial facilities or very large medical campuses in Minnesota. These waste combustors will employ air pollution control technologies similar to Minnesota's municipal waste combustors. The start-up procedures are similar to those of the large waste combustors, and should take less time, because there is less refractory and combustion equipment that needs to be warmed up. Shutdown routinely occurs at Class III and D waste combustors because most are not continuously operate. If the rules specify when emission limits apply, the waste combustor operator will be able to proceed through shutdown procedures without fear of being out of compliance. The three-hour limitation is therefore considered a reasonable application to Class III and D waste combustors.

The federal definition of malfunction is included in this subpart, in order to clearly specify what constitutes a malfunction (40 CFR 60.2). The definition already applies to sources in Minnesota that are regulated by an NSPS. It is reasonable to specify what is a malfunction, so that an operator must always conduct reasonable maintenance and careful operation of a waste combustor. The claim of a malfunction is reserved for those events that are not predictable.

e. **Subpart 5. Transition for Class A, B, or C Waste Combustors.** The subpart is proposed to give owners and operators of existing waste combustors a period of time within which they can make the transition to compliance with the new standards. Class A, B, and C waste combustors which were issued air emissions permits prior to December 20, 1989, are required to comply with the content of the rule within three years of the effective date of the rules. EPA incorporated the requirements of the CAA (42 USC Sec. 129. (f)(2)) in the emission guideline which requires the states to promulgate rules for municipal waste combustors by incorporating the promulgated emissions guidelines. (40 CFR 60.38a). The states' rules must require that MWC be in compliance within 36 months after the effective date of state emission standards. (40 CFR 60.38a).

No transition period is needed for Class I or II, as there are none currently operating in Minnesota.

f. **Subpart 6. Transition for Class D, III and IV Waste Combustors.** This subpart requires that Class D, III and IV waste combustors must achieve compliance within two years of promulgation of this part. These facilities, because they are much smaller, require much shorter construction or modification periods. The emission standards proposed in this rule for Class D and III facilities will require the installation of good particulate matter control equipment, and will allow these waste combustors to use a variety of control equipment to achieve the proposed emissions limitations. The proposed emission limitations may not require the installation of air pollution control equipment at all Class IV facilities, because the emission standards are based on the use of very good combustion equipment and good operating practices. Two years is a reasonable period of time because Class IV facilities will not require extensive modifications/construction to come into compliance.

7. Reasonableness of Part 7011.1220--Prohibitions

Prohibitions are established in this part for certain wastes and certain applications of waste combustors. This part prohibits the operation of a large segment of Class IV waste combustors, and also prohibits certain waste from being combusted without MPCA review and approval.

a. Subpart 1. Prohibited Waste Combustors. Minnesota users of Class IV waste combustors can be separated into four general groups: retail/commercial/industrial firms, hospitals/nursing homes/other medical waste generators, crematoriums, and metal recovery firms.

This subpart states that no person shall operate a Class IV waste combustor unless it is a hospital incinerator, crematorium, pathological waste combustion, animal carcass waste combustor, a forensic science laboratory or a metal recovery incinerator. All other Class IV waste combustors will be prohibited.

During MPCA's consideration of how to regulate the Class IV waste combustors, three factors were evaluated:

1. Environmental impact of these waste combustors.
2. The MPCA's resources available to enforce either existing or proposed standards at Class IV waste combustors;
3. Cost to the waste generator to own and operate a waste combustor of this size that complies with the current standards or will comply with the proposed standards versus cost of other methods of disposal.

(1) Environmental Impacts

The MPCA estimates that there are up to 1300 of these facilities in operation throughout the state. Of these, as many as 1,000 are located in grocery stores, most of which are in greater Minnesota. The remainder of the 1,300 are in hospitals, nursing homes, other retail/commercial facilities, industrial facilities and governmental units.

Operation of the existing Class IV waste combustors results in high localized ambient air concentrations of PM, metals, and dioxins, as discussed in the statement of need. Dioxin emissions from the Class IV waste combustors accounts for up to 93% of the dioxin emissions all from waste combustion activities.

(2) MPCA Resources

A study conducted by the MPCA of the emissions from three Class IV hospital incinerators showed that each of the three hospital incinerators exceeded PM or opacity emission limits contained in the current standards of performance. These three particular incinerators were selected for testing because they best represented the hospital waste incinerators in use throughout

Minnesota at that time (Ref. 106.) Because these three incinerators did not demonstrate compliance, the MPCA believed the remaining 140 or so hospital incinerators were also likely to be out of compliance. In 1992, the MPCA requested all hospitals operating waste combustors to demonstrate compliance with the existing rules, upgrade the incinerator to achieve the existing standards, or cease operation entirely. As a result of this activity, there remains only about 20 of the original 140 hospital incinerators still operating. These 20 have or are scheduled to demonstrate compliance with existing standards of performance for incinerators by the end of 1993.

It is believed that existing Class IV incinerators in operation by other users are not any different from those found at hospitals. Like the hospital incinerators, the waste combustors have not been subject to permitting, consistent and routine demonstrations of performance, or routine inspections by the MPCA staff. Air emissions from waste combustors are affected by the content of the waste stream. Because the MPCA does not have notification requirements for these waste combustors, the MPCA has been unable to properly notify these facilities of solid waste management requirements that potentially impact air emissions, like bans on the disposal of mercury wastes.

The amount of MPCA resources necessary to ensure that Class IV waste combustors currently in operation are in compliance with existing rules would be great. Currently, Air Quality Division staff currently regulate approximately 1,300 air emission sources through issuance and enforcement of air emission permits. The MPCA Air Quality enforcement staff conducts about 450 facility inspections per year. At this rate, if the MPCA did not conduct inspections of the existing 1300 facilities for which the MPCA has responsibilities for monitoring, the MPCA could locate and inspect 1300 waste combustors in 3 years. This is a very optimistic assessment, because before enforcement could be undertaken, the Class IV waste combustors would have to be located. Significant quantities of staff time would be necessary to locate the waste combustors, ensure that stack testing is completed (conducted at the expense of the waste combustor owner), review the stack test results to determine the status of compliance, and follow up with enforcement where noncompliance was determined. Further, this leaves the facilities that MPCA has committed to inspect under its federal operating grant from EPA uninspected during those three years.

The MPCA's experience with the hospital incinerators in the state was described, because it suggests that most of the on-site incinerators will likely not meet existing air emission standards. It follows that regardless of standards imposed under revised rules, most Class IV waste combustors would not be able to meet them. The MPCA expects that Class IV owners/operators would choose to cease operation because as it will be demonstrated in the next section, the cost of upgrading the existing incinerators to existing standards is more costly than to find alternative means of waste disposal.

The most efficient means of dealing with the expected noncompliance of on-site incinerators and the resulting impact on air quality is to ban their use.

(3) Costs of Waste Disposal Alternatives

The MPCA developed an analysis of the cost of disposal of waste at Class IV waste combustors, and the alternatives to using the combustor. The analysis of the costs are contained in the document entitled "Estimated Cost of Waste Disposal/Incineration and Alternatives". The cost to groceries and commercial/industrial waste generators are contained in Chapter 7 of Exhibit 3 The costs to hospitals and other medical waste generators is contained in Chapter 6 of Exhibit 3. This analysis was distributed by the MPCA for comments from interested and affected parties. Those parties' comments have been taken into consideration.

a. Retail/Commercial/Industrial Waste Generators

The MPCA has determined that in the case of a grocery store, other retail, or commercial industrial facility, it is always less expensive to use commercial disposal of solid waste with or without recycling than to incinerate the same quantity of solid waste. Table 5 presents the costs from the MPCA analysis. The MPCA investigated all costs associated with the installation, operation, and maintenance of the equipment required for incineration, compacting and/or baling and recycling solid waste (Exhibit 3, Chapter. 7). The costs evaluated included equipment purchase and installation, operating costs (including labor, fuel, taxes, administration, and solid waste disposal costs) and debt service costs.

For grocery stores, it is estimated that the cost to recycle corrugated paper and dispose of other solid waste in the MSW system is slightly less than the cost to operate an existing incinerator that has its capital costs paid off. The estimated cost to incinerate all waste in a newly installed waste combustor (method 2 or 3) is 2 to 6 times greater than the estimated cost to use the MSW system with or without recycling (method 4 or 5). For a waste combustor at a commercial/industrial facility, it is estimated that the cost to use the MSW system with or without recycling is slightly less than the cost to operate an existing incinerator with no outstanding debt. The estimated cost to incinerate all waste in a newly installed waste combustor that would comply with the proposed standards is approximately twice the estimated cost to use the MSW system with or without recycling.

Table 5 Waste Disposal Costs for Class IV Waste Combustor,
1992 Dollars

Waste Disposal Method	Grocery Store	Commercial/Industrial
Operate an Incinerator at Current Standards, Debt Retired	$ 91/ton	$131/ton
Install and Operate a New Incinerator at Current Standards	$154/ton	$150/ton
Install and Operate a New Incinerator at Proposed Standards	$452/ton	$270/ton
Waste is Baled and/or Compacted, Recycle and/or use MSW System	$78 to $85/ton	$117 to $210/ton
Waste Stored On-site, use MSW System	$127 to $204/ton	NA

Due to the availability of other methods of disposal at a cost savings to the waste generator, the cost of enforcement of any standard and the environmental impact of Class IV waste combustors, the MPCA believes the best method of regulating these waste combustors is by prohibiting their use.

The amount of waste disposed of in these facilities is estimated to be 138,000 tons per year. This would account for approximately 1/10th of one percent of the total solid waste disposal capacity in Minnesota in 1993 (Ref. 107). There is sufficient capacity for disposal of this waste in the existing municipal and industrial solid waste management system.

(b) Hospitals/Nursing Home/Other Infectious Waste Generators

Hospitals incinerate infectious waste, pathological waste and solid waste. Hospitals generate varied quantities of infectious waste. The quantity is dependent upon the hospital's size, waste handling procedures, and the health care services offered at the hospital. Also, some MSW hauling services will not accept waste from hospitals, because it "looks" like infectious waste, regardless of its true infection potential. In these instances, hospitals may choose to manage some portion of the solid waste as infectious waste, and incinerate it. All hospitals are unique from other Class IV waste combustor owners in that they generate quantities of infectious waste that requires specific handling, storage and disposal requirements.

Infectious waste disposal can be a significant cost for hospitals. In the MPCA's cost analysis, several methods of waste disposal were investigated including: commercial disposal of infectious waste and solid waste, autoclaving infectious waste and commercial disposal of the decontaminated waste and solid waste, on-site incineration of all waste (infectious and solid), and incineration of infectious waste and commercial disposal of solid waste (Exhibit 3). The estimated costs of hospital waste disposal is shown in Table 6.

From this analysis, it was determined that in the case of small hospitals, which generate small quantities of infectious waste, it is less expensive (at current and foreseeable costs) to use commercial disposal than to operate an incinerator. However, as the size of the hospital increases (and the quantity of infectious waste increases), the cost to incinerate some or all of a hospital's waste becomes comparable with the cost for commercial disposal for solid waste and infectious waste.

Nursing homes generate extremely small quantities of infectious wastes and large quantities of solid waste. The largest nursing home in the state (400 plus beds) generates considerably less than one ton per year of infectious waste while a small hospital (49 beds) on average generates over five tons per year of infectious waste.

According to the infectious waste plans submitted to the MPCA in January 1993, less than ten percent of the nursing homes in Minnesota currently operate an incinerator. Clearly, most nursing homes have found alternatives to incinerating waste on site. Many of the hospitals that currently operate an incinerator accept infectious waste from other small quantity generators such as nursing homes and are likely to continue to do so.

Since infectious waste generators must always have a means of disposal available to them, and the number of commercials providers of infectious waste disposal in Minnesota is small, it was decided that to propose a ban on hospital waste incinerators would place hospitals in a position of extreme dependence on those few commercial infectious waste disposal providers. This could result in uncontrolled disposal costs for hospitals, a group of waste generators that currently is economically distressed. For this reason, the MPCA has chosen to exempt waste combustors used at hospitals from the ban on Class IV waste combustors.

Table 6 Waste Disposal Costs at Hospitals
($/ton of waste generated)

Tons of Infectious Waste and Solid Waste	**37.4**	**187**	**449**	**919**
Waste Disposal Method				
Install Upgraded On-site Incinerator (1)	$1,333	$491-561	$437	$332-459
Install Autoclave and Shred (2)	$1,208	$730	$511	$423
Commercial Disposal of All Waste (3)	$679-794	$460-583	$357-481	$247-297
Existing Incinerator Debt Retired	$737	$285-365	$246	$162

Notes: (1) Upgrade or replace incinerator for infectious and solid waste disposal (2) Autoclave and shred infectious waste; send decontaminated waste with solid waste to municipal solid waste system (3) Contract for commercial infectious waste disposal; send solid waste to municipal solid waste system

By exempting hospitals from the ban on Class IV incinerators, the number of infectious waste disposal providers for nursing homes and other small quantity infectious waste generators is not limited to a few commercial facilities. This should result in stable infectious waste disposal costs for very small quantity infectious waste generators.

Even under worst-case infectious waste disposal cost scenarios, infectious waste disposal is not the dominant factor of overall waste disposal costs at nursing homes. All other wastes generated at a nursing home can be disposed of through the MSW system. For these reasons, it reasonable to ban Class IV waste combustors from use in nursing homes.

Several medical device manufacturers and contract medical labs in the Twin Cities operate incinerators for animal carcass disposal and infectious waste disposal. The amount of infectious waste incinerated in these combustors is a small fraction, compared to the amount of animal carcasses and pathological waste combusted. These combustors can be compared to the combustors used at very small hospitals for infectious waste disposal. (Exhibit 3, Chapter 6). The costs to continue to operate these waste combustors in their current state is higher than using contract disposal services. Since the cost to dispose of this waste via commercial services is much lower than upgrading the incinerators, the MPCA has chosen to ban these waste combustors, unless they are operated to combust solely pathological wastes or animal carcasses, as described below.

(c) Forensic Science Laboratories

Forensic laboratory incinerators combust medical waste and evidence. Medical waste is generated during the analysis of evidence in criminal cases. Because of privacy interests surrounding evidence analyzed by forensic science laboratories, it is necessary to allow these laboratories to dispose of evidence on site (Appendix 5). For this reason, it is reasonable to exempt forensic science laboratories from the ban on Class IV waste combustors. For further discussion of waste generated by forensic science and the exemption of these incinerators from the ban on Class IV waste combustors, see Appendix 5.

(d) Cremation/Pathological Waste/Animal Carcasses

In some cases, there is no practical substitution for Class IV waste combustors. Class IV waste combustors are used for the cremation of humans and pathological waste and the disposal of animal carcasses at farms and veterinary laboratories and clinics.

Some animals like sheep cannot be rendered, as they carry diseases that are not destroyed by the rendering process, contaminating the products derived from rendering. In the poultry industry, diseased carcasses must be disposed of quickly to halt the spread of the disease, and so are frequently incinerated on-site. There are no suitable alternatives to dispose of this waste. For these reasons, it is reasonable to exempt human and animal crematoriums, and pathological waste combustors from the ban on Class IV waste combustors.

(e) Metal Recovery

There are ten known metal recovery incinerator units currently operating in Minnesota. These waste combustors burn off the combustible fraction of a waste and recover precious and semiprecious metals from the ash. Radiographic and photographic film, printed circuit boards and wipes that have been in contact with jewelry during manufacture of the jewelry are typical wastes burned in metal recovery incinerators. There is no adequate substitute for incineration for this process and to ban these incinerator would effectively ban the industry. For this reason, it is reasonable to exempt metal recovery incinerators from the ban on Class IV waste combustors. Because of the potential for poor operation to cause unacceptable concentrations of air contaminants, standards of performance are imposed on these facilities, as well as the requirement to obtain an air emissions facility permit.

b. Subpart 2. Wastes Requiring Special Approval. Subpart 2 excludes two wastes from combustion, unless specifically allowed in the permit. The proposed subpart prohibits burning yard wastes and waste tires unless they are specifically allowed in the waste combustion's permit.

Yard waste must be reused, composted, or co-composted, and cannot be accepted at a resource recovery facility, unless authorized by the MPCA. Minn. Stat. § 115A.931 (1992). This prohibition applied to the metropolitan counties beginning January 1, 1990 and in the non metropolitan areas of Minnesota on January 1, 1992. Waste combustors are considered a resource recovery facility when the combustor recovers heat from the waste, therefore, this prohibition applies to waste combustors. It is reasonable to remind waste combustor operators that yard waste is not acceptable at a waste combustor, and the operator is required to seek MPCA approval to combust this waste.

Tires may not be combusted without specific approval in the permit. Tires are also banned from Minnesota's landfills. Minn. Stat. §115A.902 (1992). Under the promulgated federal standards for municipal waste combustors, tires are classified as a MSW (40 CFR 60.51a). Interest in combusting tires is likely to increase, because of the prohibition on land filling tires, the need to find alternatives to land disposal, and the inclusion of tires in the federal definition of MSW.

Tires have a much higher fuel value than garbage and significantly higher sulfur content than MSW, wood, or in some instances, even coal. Table 7 shows some general examples of potential sulfur dioxide (SO_2) emissions, if all of the sulfur in the fuel was converted to SO_2.

Table 7 Sulfur Content, SO_2 Emissions of Various Fuels

Fuel	Fuel Value Btu per lb	Sulfur Content % By Weight	SO_2 Emission Lbs per MMBtu
Tire Derived Fuel	14,860	1.6	2.17
Municipal Solid Waste	4,500-6,000	0.212	0.71 - 0.94
Refuse Derived Fuel	5,000	0.264	1.05
Wood (10% moisture)	8,000	0.003	0.0093
Coal (Wyoming, Subbit)	9,420	0.4	0.64
(Wyoming, Bit)	12,960	0.5	0.77

(Refs. 108, 109, 110, and 111)

When burned, tires release the sulfur as sulfur dioxide, a criteria pollutant, for which federal and state ambient air quality standards have been promulgated (40 CFR 50, Minn. Rules part 7009.0080). Air pollution control equipment must be installed to "scrub" sulfur dioxide from air emission streams, or fuel limitations must be specified in the permit in order to comply with these regulations and rules. It is reasonable to require special authorization to burn tires because the combustion of tires has special consequences, due to the very high sulfur content. Sulfur dioxide ambient air impacts need to be investigated and properly limited in the permit.

8. Reasonableness of Part 7011.1225--Standards of Performance for Waste Combustors

The following presents the statement of reasonableness of the proposed standards of performance for waste combustors. Because the federal regulations and guidelines include standards of performance for waste combustors, it is necessary that Minnesota's proposed rule also includes such standards of performance. In the following discussion it is noted that in several cases, the proposed rule is more stringent than the federal regulations and guidelines.

Part 7011.1225 establishes in each subpart a table to which a waste combustor owner or operator must refer in order to determine the applicable air emission limits. The tables are contained in parts 7011.1227 to 7011.1233. This part also states that emissions must be corrected to a reference condition of 7% oxygen (O_2) or 12% carbon dioxide (CO_2) concentration. A standard oxygen or carbon dioxide concentration is specified to ensure that stack gases are not diluted with air to meet concentration limitations, to ensure consistent application of standards, and to allow a basis of comparison between combustor facilities. The 7% O_2 and 12% CO_2 concentration are equivalent to a waste combustor operating at 150% excess air. This is a typical operating condition for waste combustors, thus is a reasonable value upon which to base a reference condition.

As described in the statement of need, EPA concluded that the standards of performance for new waste combustors need to be established due to health-related issues. When standards of performance have been promulgated by EPA under section 111(b) of the Clean Air Act (CAA), section 111(d) requires that states submit plans which establish emission standards for existing sources. Federal regulation 40 CFR 60.24(c) requires States to develop emission standards that are at least as stringent as the guidelines, unless justification is provided to demonstrate that the guidelines are unreasonable for specific applications and alternate emission limits are adopted. Additionally, states may, under section 116 of the CAA, require more extensive controls than are necessary to meet the emission guidelines in order to address concerns which are specific to a given State or a particular localized air quality situation (56 FR 5515, 2/11/91).

When EPA began its development of standards of performance for new MWCs and emission guidelines for existing MWCs, emission levels specified in the standards and guidelines were determined to be "best demonstrated technology" (BDT), or a standard of performance that reflects the degree of emission control achievable through the application of the best system of emission reduction, as determined by EPA to be adequately demonstrated. Determination of the best demonstrated technology must consider the cost of achieving such reductions, and any nonair quality related health and environmental impact and energy requirements. Clean Air Act Sec. 111 (a).

The amendments to the CAA in 1990 defined a new level of control for waste combustors. Section 129 of the Act states that standards of performance for both new and existing waste combustors must now reflect the application of maximum achievable control technology (MACT). The standards of performance for new waste combustor units must reflect the level of reduction achieved by the best-controlled similar existing unit. The technology selected as MACT for existing waste combustors must, at a minimum, perform as well as the emissions limitation achieved by the "best performing 12 percent of the units in a category" (Clean Air Act Sec. 129 (a)(2)).

EPA has chosen to determine MACT by first evaluating available control technologies, and ordering them in terms of their efficiency in controlling pollutants. Then the population of existing facilities is evaluated against the ordering of technologies. If more than 12 percent of the population is using a particular control technology, that technology shall be used to establish achievable emission limits. The minimum performance level is referred to by EPA as the "MACT floor". No technologies performing below the floor can be used to establish standards of performance for municipal waste combustors.

The various technologies that are used to control air emissions from waste combustors must first be characterized to determine their levels of performance. The MACT standard for new facilities is the best performing technology in practice, so the best performing technology must be determined. For existing facilities, the technologies' performance must be ordered, and compared to what is in use at the top-performing 12 percent of operating waste combustors to determine MACT.

In order to present the standards of performance in a clear manner, a discussion of technologies available to control emissions is presented. The discussion first focuses on technologies available at municipal waste combustors. Mercury control is then presented, followed by the statement of reasonableness of proposed part 7011.1227, Table 1, which contains the standards of performance for Class A, B and C waste combustor facilities. The statement of reasonableness for proposed part 7011.1229, standards of performance for new Class I and II waste combustor units follows.

A discussion of the control technologies for industrial, medical and commercial waste incinerators follows the statement of reasonableness for new and existing MWCs.

a. Basis for Standards Development

It is not the intent of this rule to establish risk-based emission limits, but rather to develop emission limits based on technology available to control emissions, and the cost to achieve the degree of control represented. The development of a risk-based emission limit requires a risk assessment.

Under current practices, risk assessments are problematic. A risk assessment provides a characterization of the environment and community in which a waste combustor is located. Those waste combustors located in urban environments have different impacts from those located in rural or pristine areas of the state. To properly assess impacts, human exposure pathways must include exposure by inhalation, and dermal exposure, as well as exposure to pollutants via uptake into the foodchain.

Risk assessments were initially used by the MPCA to establish emission limits for a specific waste combustor facility. The MPCA learned that this process was cumbersome, slow, and exceedingly controversial. The inputs to models used to conduct risk assessments, and the models themselves were often disputed, putting the MPCA in the position of arbitrating between different scientific views and applications of toxicological data which is often incomplete. This process often did not result in agreement among the affected or interested parties. Further, this process required huge amounts of MPCA staff time, devoted to few facilities.

EPA must develop methods of assessing risk from sources subject to regulation under the air toxics provisions of the Act. EPA is to report to Congress on this activity by 1996. Clean Air Act Sec. 112 (f). This activity will potentially yield standardized risk assessment practices for the United States, which would eliminate much of the difficulty associated with conducting risk assessments at the state level. Section 129 of the CAA directs EPA to promulgate standards for waste combustors for dioxins, lead, cadmium and mercury, and then to evaluate the risks from the facilities using the standardized risk assessment procedures.

Standardized risk assessment procedures are not currently available, however. Under existing Minnesota rules, risk assessment may be part of environmental review. In some cases, environmental review and risk assessment will be mandatory, but in many instances, they will be discretionary.

The MPCA recognized at the outset of this rule making effort that significant staff time was necessary to research air pollution control techniques and monitoring requirements, examine related solid waste issues, as well as develop standards to address mercury emissions. The MPCA also recognized that restrictive air emission limits would reduce the amount of pollutants currently released to the atmosphere, and would thus reduce environmental impacts by simply lowering the amount of pollutants released to the environment, particularly in the case of the pollutants mercury and dioxins.

Emissions will also be reduced as a result of the air toxics program. The Clean Air Act of 1990 requires EPA to develop a program to control air toxic emissions. The MPCA has undertaken the development of rules related to the control of toxic air emissions from all sources in Minnesota to incorporate various requirements of EPA's program as it is developed, and to address air toxic emissions that EPA may not include in the federal program. One of the elements that the MPCA is considering to supplement the EPA toxic air emission programs is environmental monitoring for bioaccumulative pollutants. It is MPCA's intent that where appropriate, environmental monitoring will be required of waste combustors that exceed emission thresholds currently under development by the MPCA. These rules are now being drafted by the MPCA.

Compliance with the proposed standards in this rule will be completed by the time EPA releases risk assessment methodologies. The MPCA will at that time be able to use those methodologies to identify which facilities are located in areas that may require further review and analysis. Reductions in the amount of pollutants released reduces the risks from exposure to the pollutants. One of the purposes this proposed rule achieves is to reduce the amount of pollutants emitted to Minnesota's atmosphere. Because of the overall reductions that will be achieved with this rulemaking, and future federal actions to develop risk assessment procedures, it is reasonable to adopt technology-based standards of performance at this time.

b. Selection of Pollutants for Control

Pollutants for control must be selected in order to determine the effectiveness of an air pollution control system. The following discussion describes the pollutants of concern in more detail. Each technology evaluated for controlling emissions from waste combustors will be evaluated for its ability to control the pollutants of concern.

(1) Particulate Matter

Particulate matter is any substance that is a solid or liquid at ambient conditions. Minn. Rules. 7005.0100 Subp. 31 (1992). PM is generated during the combustion process by the entrainment of noncombustible materials into the air added to the combustion process, from the incomplete combustion of combustible materials, and/or from the condensation of vaporous materials that have exited the combustion chamber.

Entrainment of noncombustible PM results from the suspension or entrainment of ash by the combustion air added to the combustion process, or by combustion technology itself. For example, most RDF combustors in Minnesota are "suspension-fired" units. When burning fuel in suspension, fuel is blown or flung into the combustion chamber. A fair amount of the fuel then burns in "suspension," while some burns on the grate at the bottom of the combustion chamber. Rotary kilns are a combustion technology where the combustion of wastes occurs in a cylinder that is rotating. In both of these technologies, the fuel bed is constantly stirred, resulting in very high uncontrolled particulate matter emissions (Ref. 112).

Particulate matter emissions also result from the incomplete combustion of the combustible portion of the fuel. During combustion, combustible material is volatilized. The portion that is not volatilized forms "char", a carbon-rich solid. Char particles are pulled along with the volatiles into the gas stream. The char particles will continues to be oxidized in the combustion chamber, resulting in its reduction to ash, release of its organic materials, and the vaporization of metals. If combustion conditions are not adequate, the reduction of char is not complete, thus it contributes to the total quantity of particulate matter released from the combustion chamber.

Condensation of vaporous materials will also contribute to particulate matter generation, particularly the PM_{10} fraction (particulate matter with an aerodynamic diameter of 10 microns). Once combustion gases leave the combustion chamber, they begin to cool. Those materials that are vapors at combustion temperatures will begin to condense. Because Minnesota rules define particulate matter as those substances that are solid and liquid at ambient temperatures, the vapors that would be liquid form at ambient temperatures are also considered particulate matter.

These condensed particulates are collected in impingers of the EPA Method 5 particulate matter sampling train. The impingers rest in a bath of ice water, which forces the condensation of the particulates. This portion of the train is referred to as the "wet catch" or "back half", whereas the solid fraction of particulate matter caught in the sampling train ahead of the impingers is called the "front catch". Particulate matter standards imposed on waste combustors considers the release of both the front, back, and total (front plus the back) catch of particulate matter.

As will be shown from the review of air pollution control devices, particulate matter removal can be used as a surrogate for removal of metals, except for mercury.

(2) Metals

As described in the statement of need, there is particular concern with metals from waste combustors, due to their heightened environmental availability when combusted. Metal emissions are dependent on their concentration in the fuel feed. Metals cannot be destroyed in a waste combustor. They must exit or accumulate within the combustion system. Some metals and metal species found in waste are volatile and vaporize in the combustion system. The vapors diffuse into the exhaust gas, and condense both homogeneously to form new particles, but also heterogeneously on the surface of other particles (Ref. 113).

Evaluation of waste combustor emissions and control options must focus on control of metals. Control of metals is achieved by minimizing their presence in waste if possible, or by causing their condensation to form PM, which is then removed in the PM control device.

In this rulemaking, the metal mercury is given considerable attention, due to its behavior as both a particulate and a gas. Mercury emission limitations are established in this rulemaking.

(3) Organics

Of significant concern are the organic chemicals dioxins. Dioxins are formed from the chlorination of benzene-ring precursors. Organic emissions from waste combustors, especially dioxins, are particularly toxic to human health and wildlife. Since the focus of control of emissions from waste combustors is in part on the elimination of dioxin emissions, dioxins limitations are established. Minimization of dioxin emissions will reduce emissions of other organic emissions as well (54 FR 52213 and 52261, December 20, 1989).

(4) Acid Gases

The control of acid gases requires the installation of acid neutralization equipment, referred to as "scrubbing" if the neutralization process is accomplished with stack gas treatment equipment. The amount of the acid gases sulfur dioxide (SO_2) and hydrogen chloride (HCl) from waste combustors is minimal in terms of the total quantities of these two pollutants released to the atmosphere. However, HCl concentrations that exceed short-term human health effect levels may occur at some waste combustors. Scrubbing has also been focused upon because improved removal efficiencies of toxic metals and organics are available when scrubbing technologies are used.

c. Description of Control Technologies for Municipal Waste Combustors

The MPCA has prepared a review of air pollution control devices (APCD), and the air emission concentrations or removal efficiencies that are achieved with these technologies. This review incorporates the findings of EPA as presented in EPA's background information documents prepared for its rule proposals, as well as an evaluation of the emission levels currently achieved by the twelve MWCs currently operating in Minnesota. The review resulted in the preparation of a technical workpaper "Performance of APCD at Municipal Waste Combustors". This workpaper contains the information relied upon to prepare the presentation of the technical component of this statement of reasonableness of the standards, and is attached as Exhibit 4.

Several other technical workpapers have been prepared as well. Mercury emission controls are evaluated in Exhibit 1, "Technical Work Paper on the Control of Mercury Emissions from Waste Combustors". Exhibit 3, "Estimated Economic Impacts of Waste Disposal/Incineration and Alternatives" contains the MPCA's assessment of the economic impacts from imposing different levels of control based on these technologies, and the cost of these controls. This discussion that follows is extracted from the technical workpapers For an exhaustive discussion of each topic, please consult the workpaper.

(1) Good Combustion Practices

Control of pollutants from waste combustors relies first on the application of good combustion practices (GCP). GCP is a combination of equipment design and application, operating parameters, monitoring and maintenance of combustion conditions that minimize the generation of pollutants from waste combustors.

GCP goals are to maximize destruction of pollutants while they are in the furnace, minimize particulate matter carry-over, and to minimize conditions downstream that allow for the low-temperature formation of dioxins. To satisfy these goals, a waste combustor must provide conditions that mix fuel and air to minimize the existence of fuel-rich pockets in the combustion system. Secondly, the combustion system must maintain temperatures that are high enough, in the presence of oxygen, to cause the thermal decomposition of hydrocarbons. Thirdly, the combustion conditions must prevent quench zones or low temperature pathways that might allow partially reacted fuel to leave the combustion zones.

GCP for MWCs has been translated by EPA into specific waste combustor operating conditions that are monitored. Specific parameters that can be continuously monitored have been identified as surrogates. Carbon monoxide has been identified as a continuously-monitored surrogate for dioxins; flue gas temperature monitoring has been identified as a continuous monitor to prevent low-temperature dioxin formation. Further, the amount of heat contained in the waste influences whether a facility will operate within its design operating window. Steam load monitoring is proposed to measure the heat load on the combustor.

Because the application of good combustion practices requires skilled operators, personnel training and operator training is an integral part of GCP, and is one component of this proposed rule making. Thorough training of personnel responsible for operating combustion equipment will minimize the likelihood of overloading the waste combustor or failing to maintain proper operating temperatures of the combustion and air pollution control equipment.

Combustion control has little effect on emissions of sulfur dioxide (SO_2) and hydrogen chloride (HCl). Emissions of these pollutants, as well as mercury emissions, are a function of the waste content. Further, control devices are necessary to minimize PM, metals and organics.

(2) Electrostatic Precipitators (Exhibit 4, pp. 20-21)

The most widely used add-on control devices currently used in Minnesota and nationally at municipal waste combustors are electrostatic precipitators (ESPs). In an electrostatic precipitator, the flue gas flows between a series of high voltage discharge electrodes and grounded metal plates. Negatively charged ions formed by this high voltage field attach to PM in the flue gas, causing the charged particles to migrate toward the grounded plates. Once the charged particles are collected, the resulting dust layer is removed from the plates by rapping, washing (called "wet" ESP) or some other method, and collected in a hopper.

ESPs are capable of very high particulate capture efficiencies, provided that they are designed at that level. Particulate matter removal rates range for highly efficient ESPs of 95 to 98 percent efficiency. When PM removal efficiencies with an ESP are greater than 98 percent, metal removals of greater than 95 percent are achieved. When PM removal efficiencies are less than 98 percent, metal removal efficiencies becomes more variable.

ESPs are available as both a retrofit technology, as well as for new construction of MWCs. ESPs can be rebuilt to achieve a PM concentration of 0.030 gr/dscf. Upgrades or additions of ESPs can achieve PM concentrations of 0.015 gr/dscf.

Formation of dioxins across ESPs has been measured, however. The operating temperatures of ESPs without scrubbing must be maintained above the dewpoint of the acid gases in the flue gas (about 400 degrees F), in order to prevent condensation, thus corrosion. Some ESPs maintains flue gas temperatures within the temperature of maximum dioxin formation (450 to 700 degrees F). Operation of the waste combustion system, when using ESPs, therefore requires sufficient flue gas cooling to ensure that downstream dioxin formation does not occur.

Acid gas control is not available with an ESP alone, as no neutralization of the acid gases occurs.

(3) Fabric Filters (Exhibit 4, pp. 30-32)

Fabric filters (FF) are also available to control PM emissions from waste combustors. These systems are most often used in conjunction with flue gas scrubbing, to achieve the large temperature reductions necessary to safely operate a FF. Quench systems, where air or water is injected into the hot flue gases, can also be used to achieve the temperature reductions.

Fabric filters remove PM by passing flue gas through a filter cake that is allowed to build up on a porous barrier, the filter bags. Flue gas passes through the filter cake, building particulate on the filter cake. When the pressure drop is reached for a bag, the filter cake is knocked off via a mechanical shaker, a pulse of air that "shocks" the bag, breaking the cake off the bag, or by reversing the flow of air. The method of cleaning generally distinguishes the type of fabric filter system.

Fabric filters are capable of achieving a front-half PM emission limit of 0.015 gr/dscf at 7% O_2.

(4) Dry Sorbent Injection

The use of dry sorbent injection has been investigated primarily as an acid gas control retrofit technology for existing MWCs. It is also a technology available at new waste combustors.

With dry sorbent injection, sorbent is pneumatically injected into the flue gases downstream of heat recovery/flue gas cooling units. Lime and sodium bicarbonate have been used as a sorbent at waste combustors. The sorbent reacts with the flue gases to form alkali salts. The salt, fly ash and any unreacted sorbent are collected with particulate matter control devices. As a retrofit technology, sorbent is injected into a duct, prior to a particulate matter control device. Separate reactor units can be constructed at existing waste combustors, and at new combustors, to provide sufficient turbulence and reaction time.

Dry sorbent injection can be combined with both an ESP and an FF. When used with an ESP, metals removal was similar to that achieved with ESPs alone, that is, at PM removal efficiencies of 98 percent, metal removal efficiencies were 95 percent. A DSI/ESP system can reduce dioxin emissions by 90 percent over an ESP alone, achieving a total PCDD/PCDF concentration of 125 ng/dscm. An SO_2 removal efficiency of 50 percent and an HCl removal efficiency of 80 percent is achieved with a DSI/ESP (Exhibit 4, p. 26).

When DSI is used with a fabric filter, the filter cake provides additional scrubbing, so that higher removal efficiencies of metals, dioxins, and acid gases are available over ESPs. Dry sorbent injection/FF achieve dioxin emission removal efficiencies of 75 percent and greater, and at new waste combustors achieve dioxin emission levels below 30 ng/dscm. SO_2 removal efficiencies are 80 percent, and HCl removal efficiencies are 90 percent, with DSI/FF (Exhibit 4, p. 31).

(5) Spray Drying

Lime spray drying with the use of fabric filters was developed to control acid gas emissions, and has been demonstrated to also achieve very high levels of metals and organics control at MWCs. SD/ESP combinations are an attractive retrofit technology, as ESPs already exist at most MWCs.

Spray drying is accomplished by injecting a lime slurry into the flue gas stream. A rotary atomizer, which is a rotating disk, can be used to atomize the lime slurry. Alternatively, high velocity air can be injected into the slurry, breaking the slurry stream up into very small particles. The water in the slurry is evaporated, and lowers the temperature of the flue gas. The lime reacts with the acid gases and forms alkali salts. The flue gases then pass through the particulate matter control device, where the salts, unreacted lime, and flyash is captured.

Spray dryers using ESPs for PM control achieve a PM emission concentration of 0.015 gr/dscf. Metal removal efficiencies of 98 to 99 percent are achieved with SD/ESP. As a retrofit technology, SD/ESP can achieve a dioxin emission limit of 60 ng/dscm and lower, when used in conjunction with GCP. SD/ESPs are not as efficient at removing SO_2 from flue gases, and achieve a removal efficiency of 70 percent. HCl removal efficiency is 90 percent. (Exhibit 4, p.27-28).

When SD is used with a FF, PM emission concentrations of 0.015 gr/dscf are achievable. At this level of PM control, metal removal efficiencies of 99 percent are also achieved. SO_2 removal efficiency is 85 percent, and HCl removal efficiency is 95 percent with a SD/FF (Exhibit 4, p32-33).

(6) Wet Scrubbing

In the United States, wet scrubbing has not been used as a typical control technology at MWCs. However, in Minnesota, two MWCs use wet scrubbers for control of air emissions.

Removal of particulate matter from the gas stream is done by using large liquid droplets. Droplets are produced by injecting liquid at high pressure through specially designed nozzles, by aspirating the gas stream through a liquid pool, or by submerging a rotor in a liquid pool. The PM is collected by implication with the liquid droplets or by diffusion. Gaseous pollutants are collected by absorption into the droplets.

The performance of a wet scrubber is affected by particle size. Venturi scrubbers by themselves are inefficient at collecting PM at the 0.1 to 0.5 micron range, a common PM size from combustion sources (Ref. 114). When combined with a packed bed scrubber, typically installed for acid gas control, particle-laden droplet removal is better.

PM control at Minnesota's two MWC with wet scrubbers varies considerably. At Fergus Falls' MWC, estimated PM removal efficiency is 86 percent, with an outlet PM emission concentration of 0.055 gr/dscf. The Western Lake Superior Sanitary District (WLSSD) venturi wet scrubber has an estimated PM removal efficiency of 99 percent, and an outlet PM concentration of less than 0.01 gr/dscf. At hazardous waste incinerators using very high efficiency venturi/packed bed towers for emissions control, a PM emission concentration of 0.02 gr/dscf was achieved (Ref. 115). High efficiency wet scrubber systems can achieve a PM concentration of 0.02 gr/dscf.

Metals control is affected by PM removal. At Fergus Falls' MWC, metals control was less than 85 percent, except for mercury, where 95 percent control of mercury emissions were estimated. At WLSSD, a fluidized bed combustor that combusts sewage sludge with RDF, metal removal efficiencies were greater than 99 percent for all metals, except for mercury, for which estimated removal efficiencies of 79 percent were estimated. Acid gas removals appear to be similar to those achieved with DSI/FF, that is, 80 percent removal efficiency of SO_2, and 90% removal efficiency of HCl. (Exhibit 4, pp. 28-30).

Dioxin emissions at these wet scrubbers also varied considerably. WLSSD dioxin emissions have measured less than 13 ng/dscm. The City of Fergus Falls dioxin emissions averaged 438 ng/dscm.

Wet scrubbing systems are suspected of encouraging dechlorination of higher weighted dioxins and furans, causing the resulting emissions to become more toxic (Refs. 116 and 117) although WLSSD has very low dioxin TE emissions .

(7) Furnace Sorbent Injection

With this technology, lime is injected directly into the combustion chamber to control SO_2 emissions. With this technology, SO_2 reductions of 50 percent are achievable. Removal of other pollutants relies on the efficiency of the air pollution control system.

(8) Summary

Table 8 below presents in tabular form the achievable emission limits for each of these technologies.

Table 8. Achievable Emission Limits at Waste Combustors
All Emissions corrected to 7% O_2

Technology	Retrofit Technology	New Construction
ESP	PM = 0.030 gr/dscf	PM = 0.015 gr/dscf
	Dioxins = 500 ng/dscm	Dioxins = 500 ng/dscm
Fabric Filter	PM=0.015 gr/dscf	PM = 0.015 gr/dscf
Wet Scrubbing	PM = 0.020 gr/dscf	
	Dioxins= 500 ng/dscm	
DSI/ESP	PM = 0.030 gr/dscf	
	Dioxins = 125 ng/dscm	
	SO_2 = 50% removal	
	HCl = 80% removal	
DSI/FF		PM =0 .015 gr/dscf
		Dioxins = 30 ng/dscm
		SO_2 = 80% removal
		HCl = 90% removal
SD/ESP	PM = .015 gr/dscf	
	Dioxins = 60 ng/dscm	
	SO_2 = 70% removal	
	HCl = 90% removal	
SD/FF		PM = .015 gr/dscf
		Dioxins = 30 ng/dscm
		SO_2 = 85% removal
		HCl = 95% removal

d. Control of Mercury Emissions

(1) Characterization of Mercury Emissions

Mercury contamination in Minnesota was first investigated in 1969 in response to reports of fish contamination from industrial discharges to lakes and streams in Sweden and California. In Minnesota, significant mercury contamination was found in rivers, the receiving waters for the bulk of waste water point-discharges in Minnesota. The contamination of fish in the

Mississippi, Red and Lower St. Louis Rivers was reduced through efforts to control mercury from their point discharges.

High mercury concentrations discovered in fish in lakes that were not affected by point discharges in Minnesota, specifically lakes in northeastern Minnesota, suggests that other sources, natural or manmade, are responsible for these elevated concentrations.

The general conclusion of MPCA's recent assessment of sources of mercury to these northern lakes are that the sources of mercury are not natural, that the inputs are rising, and that the deposition of mercury from the atmosphere can account for most of the mercury found in these lakes (Ref. 118). Additionally, it appears that atmospheric mercury can be transported long distances (Ref. 119). Because mercury bioaccumulates, many Minnesota lakes have had fish advisories placed on them to prevent mercury poisoning to humans. The bioaccumulation of mercury in fish has threatened Minnesota loons (Ref. 120).

At the national level, the Clean Air Act amendments of 1990 require EPA to establish mercury emission limits for waste combustors. (CAA, Sec 129(a)(4) and (b)(1)) In addition to this action, other federal regulations or investigations exist to control emissions of mercury to the atmosphere. Federal regulation 40 CFR 61.50 establishes air emission limitations of mercury from sewage sludge incinerators, facilities that process mercury ore, and chlor-alkali plants. The CAA amendments require EPA to examine emissions of mercury and its compounds and determine whether additional controls are needed, as well as perform a study of the hazards of emissions by electric utility steam generators (CAA Sec 112 (b), (n)).

In order to assess mercury emissions, a technical workpaper was prepared, and is attached as Exhibit 1. This workpaper contains an assessment of existing conditions in Minnesota, including sources of atmospheric mercury emissions, baseline emissions data for Minnesota's municipal and medical waste combustors, and an assessment of control strategies for mercury. It also contains a statistical analysis of the data used to establish achievable mercury emission limitations for waste combustors.

(a) Mercury Sources in the Waste Stream

Mercury emissions from waste combustors result from the presence of mercury in the waste stream. As described in the statement of need, a national study has attempted to characterize the quantity of mercury in the manufactured products in the MSW stream (Ref. 121). Total mercury discards from manufactured products in 1989 were estimated at 708.5 tons of mercury. The study indicates that mercury discards in MSW appear to have peaked in 1986. The report suggests the decline is due to pressures to reduce toxic component of consumer goods.

In 1989, batteries from households and other sources of MSW were the largest source of mercury. Alkaline batteries accounted for 63 percent of the total mercury in the waste stream, while mercury-zinc batteries (e.g. hearing aid batteries) accounted for 25 percent of the total mercury in MSW. Light bulbs, thermometers, and thermostats are estimated to have contributed most of the remaining of mercury. Pigments and dental use accounted for only 2 percent of the total mercury contribution to MSW. This study did not include mercury used in paints, as the report assumed paint wastes are handled outside of MSW collection (Ref. 122).

The Kearny and Franklin report focuses on manufactured products where mercury is purposely introduced. The study does not account for the presence of mercury as a trace contaminant in other materials. A waste composition study conducted in Vancouver, Canada, identified paper and organic fraction (yard waste, textiles, food waste) as contributing 66 percent of the mercury found in the waste stream (Ref. 123). Mercury is probably present in paper because mercury is present in wood and may be used in papermaking as a fungicide.[10] Yard waste may have mercury in it from the application of fungicides, from atmospheric deposition, or from uptake from

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10 Telephone conversation between Mr. David White of Radian Corp. Ms. Anne Jackson of the MPCA on August 2, 1993.

the soils in the Vancouver area. Mercury may be present in textiles because it was bioaccumulated in natural fabrics (cotton, linen, rayon), is present in inks and dyes, or in the chemicals used to prepare fabrics and leathers.

Another waste composition study was conducted in Cape May, New Jersey. The overall estimated concentration of mercury in the trash was 3.6 ppm on an as-received basis. The results are dominated in this study by a lab analysis of alkaline and carbon zinc batteries, reported to have an average mercury concentration of 0.29 percent, contributing 88 percent of the overall mercury in the waste stream. The individual waste category with the second-highest mercury concentration was "other combustibles" (combustible materials that were not paper, plastic, or sorted into other categories), contributing 5 percent of the total mercury in the waste stream. The waste category with the third individual highest mercury concentration was wood, contributing 2 percent of the total mercury. When paper and other organic categories not previously accounted for are combined, this group contributes about 4 percent of the waste stream mercury (Ref. 124). Base on these findings, it appears that eliminating batteries, including alkaline and carbon zinc, will significantly reduce the amount of mercury in the waste stream, but will not eliminate mercury from waste.

In 1988, the United States generated 180 million tons of MSW (Ref. 125). Using Kearny and Franklin estimates for mercury discards in the MSW stream, the mercury content of the national MSW stream is 4 ppm (0.0078 lb/ton of waste), very nearly the concentration determined in the Cape May study. By the year 2000, EPA projects that MSW generation to reach 216 million tons. The resulting annual mercury content of the national waste stream, based on the Kearny and Franklin projections, is estimated to be 1 ppm (0.0017 pounds per ton), a reduction of about 75 percent.

Extensive legislation has been enacted in Minnesota to force the removal of mercury from the solid waste stream, which will in the long-term reduce the amount of mercury in the waste stream. It is unknown at this time whether these efforts will reduce mercury concentrations in Minnesota's waste below the Kearny and Franklin projections. A summary of Minnesota statutes that refer to the control or use of mercury is contained in Appendix 6.

The Kearny and Franklin report estimates that batteries will continue to be the largest source of mercury in the waste stream. The results of the Cape May, New Jersey analysis confirm this estimate. However, the other sources (manufactured products as well as nonmanufactured products) as shown in the Vancouver study, are also contributors to mercury in the waste stream.

(b) Variability of Mercury Emissions

Items with high concentrations of mercury are not uniformly distributed in the waste stream. Batteries, thermometers, or mercury found in barometers, thermostats, or other measuring or regulating devices are randomly distributed through the waste stream. Coupled with mercury's high volatility, mercury emissions from waste combustors are expected to be highly variable, depending on whether a high mercury-content item was in the waste being burned at a given moment. Short-lived spikes would occur when high concentrations of mercury are encountered in the combustor, even if the overall mass of mercury in the waste stream is low.

Figures 4 and 5 present results collected during development of a mercury emissions continuous emissions monitor (CEM). As shown in Figure 4, MSW combustion exhibits discrete spikes in mercury concentrations that can be over an order-of-magnitude higher than baseline levels. The spikes last for less than five minutes, and could reflect the rapid volatilization of mercury present in a high mercury battery or some other item. Figure 5 represents mercury emissions from a sewage sludge incinerator. Much less variability is noted, suggesting that the mercury is more uniformly distributed in the sewage sludge.

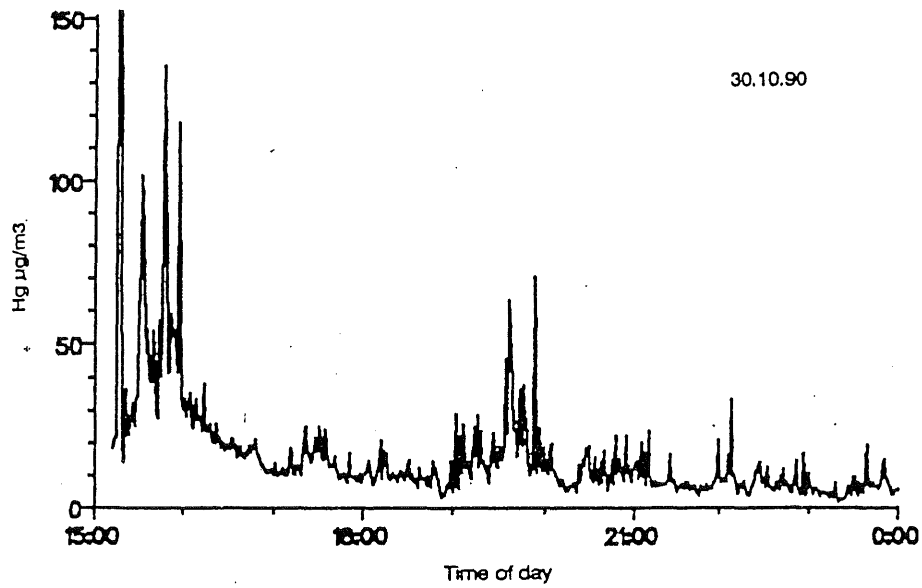

Figure 4. Continuous Mercury Emissions from a Municipal Waste Combustor

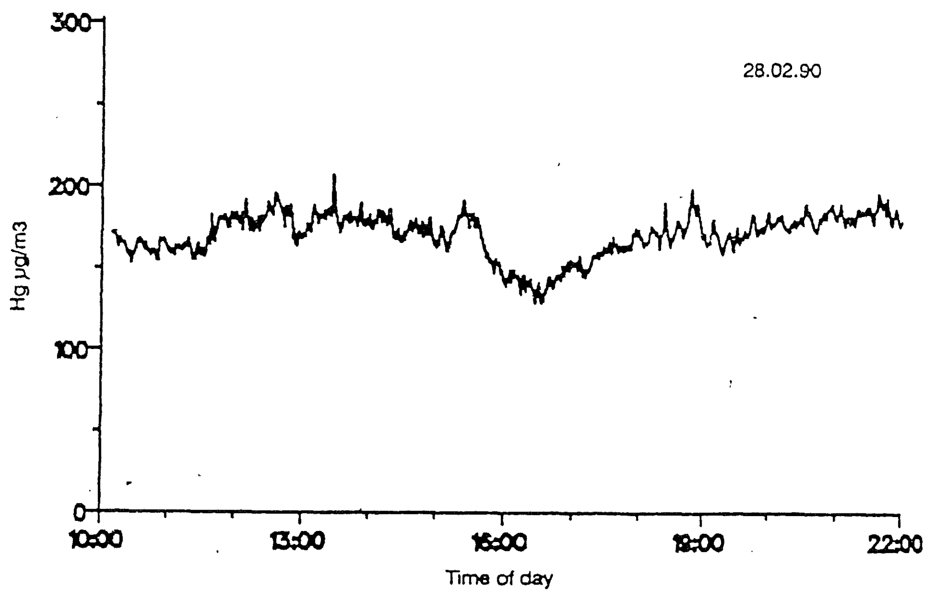

Figure 5. Continuous Mercury Emissions from a Sewage Sludge Incinerator

Uncontrolled mercury emissions from municipal waste combustors nationally range from 200 to 1400 ug/dscm (Exhibit 1, Appendix A). The causes of the variations could be the waste management/generation practices of the service area, as well as the short-term spikes from occasionally combusting high mercury-content wastes. A battery separation program for example will reduce the overall average emission rate by lowering spikes or the frequency of spikes. However, if a battery or thermostat ballast is not separated for other disposal, the spikes are still likely to occur. The implication of this rapid variation in mercury emission concentrations is that establishing emission limits for mercury must reflect both the average mercury content in the waste as well as recognize the potential for spikes in mercury emissions caused by discrete items such as batteries or thermostats, even with good combustion and air pollution control system operation.

(c) Mercury Emissions Measurement

The ability to measure air concentrations to provide accurate and reproducible data also affects the variability of mercury emissions. An analysis of variance conducted on mercury emissions testing at the MWC facility in Stanislaus County, California found that in the absence of carbon injection for mercury control, and at low or medium carbon injection rates, most of the variability in outlet mercury levels was due to variations in waste composition, as described above. At high carbon feed rates, however, the variability in measurements was due primarily to the imprecision of the measurement method itself.

When mercury emissions are being measured, typically one of two methods developed by EPA is used. Method 101A (promulgated by EPA as 40 CFR Part 61, Appendix B, Method 101A) was developed to measure particulate and gaseous mercury emissions from sewage sludge incinerators. A second method referred to as "Method 29" is also available to measure emissions. The method was developed by EPA to measure a number of metals from combustion sources with a single sampling train. The procedures used for sampling flue gas stream and analysis of the collected sample are contained in 40 CFR Part 261, Appendix IX, Section 3.1. The term

"Method 29" is applied because EPA is expected to promulgate this method as Method 29 in 40 CFR Part 60, Appendix A when mercury emission limits are promulgated for waste combustors.

These two methods use different flue gas sampling trains, and different methods of sample preparation prior to analysis. A detailed description of the differences in how the samples are collected, prepared and analyzed is presented in Exhibit 1, Chapter 4. Based on a one-hour sampling time, both methods have an approximate analytical detection limit of 25 ug/dscm however, they have a different consistency in measured mercury emissions.

During five of the operating conditions examined as part of the EPA-sponsored testing at the Stanislaus County MWC, simultaneous measurements of mercury flue gas concentrations were made over a range of carbon injection rates. Dual sampling trains were operated side-by-side, one a Method 101A train, the other a Method 29 train.

These data were subjected to a statistical analysis, which shows a consistent difference between the two methods. Method 29 measured mercury concentrations that are an average of approximately 30 ug/dscm higher than the concentrations determined using Method 101A. The cause of the lower average measured values with Method 101A are unknown, but have been observed during other EPA test on MWIs (Exhibit 1, p 4-9).

A review of the measurement consistency for the dual sampling trains also indicated less variability (better precision) with the Method 29 train. The relative standard deviation (RSD; or the standard deviation divided by the average) for Method 29 at flue gas concentrations of less than 200 ug/dscm was 20.7 percent. For Method 101A, the RSD was 39.5 percent.

In summary, Method 29 measured higher average mercury concentrations and had better precision than Method 101A. As a result, Method 29 is proposed elsewhere in this rule as the method for measuring mercury concentrations to determine compliance with the mercury emission limitations.

(d) Mercury Emissions from Municipal Waste Combustors

A review of mercury emissions from MWCs operating in the United States was undertaken by Nebel and White in 1991, and is contained in Exhibit 1 as Appendix A. In this review, it was theorized that mercury emissions are a function of flue gas temperature and the amount of carbon in the fly ash when the flue gases are cleaned. Direct measurement of the fly ash content is not routinely measured during stack tests, so, to characterize a facility's mercury emissions, dioxin emission levels were examined. Poorer combustion conditions would increase the amount of fly ash carbon, when higher dioxin emissions are frequently encountered. It was expected that the higher the dioxin emission concentration, the higher the carbon content in fly ash.

Some of the MWCs demonstrated the ability to remove mercury from the flue gases, while others did not. MWCs using only ESPs were unable to remove mercury from the flue gases. MWCs with acid gas scrubbing had variable removal efficiencies, while RDF combustors showed the lowest mercury emissions of all types of waste combustors.

The differences in control efficiencies and mercury emission concentrations at the MWCs appear to be due to the operating conditions of the air pollution control system, as well as the waste combustor technology. At high flue gas temperatures (greater than 400 degrees F) or low dioxin levels (less than 200 to 300 ng/dscm), mercury control by all types of air pollution control systems appears to be low. At lower flue gas temperatures and higher dioxin concentrations (higher fly ash carbon), mercury control increases significantly. In addition, combustion facilities with higher inlet particulate matter emission concentrations or higher dioxin emissions showed higher mercury removal rates than those facilities with low particulate matter loadings or low dioxin levels (Exhibit 1, Appendix A, pp. 2-8).

Mercury is volatile at the temperatures found in all combustion systems, such that essentially all of the mercury present in the waste stream will exist in combustor flue gas as vaporous elemental mercury (Hg^{0}). As the temperature of the flue gas decreases to 400 to 750 degrees F, elemental mercury oxidizes to form mercuric chloride ($HgCl_2$) and mercuric oxide (HgO). The speciation of mercury into elemental and oxidized forms is important because oxidized mercury is readily removed from flue gases (Exhibit 1, pp. 3-9 to 10).

Review of MWCs using acid gas controls showed a range of results. The DSI/ESP system had a very small impact on controlling mercury emissions, removing only 30 percent of the mercury in the inlet gases (Exhibit 1, Appendix A, pp. 2-6). The DSI/FF systems evaluated indicated variable control levels as well. One DSI/FF system showed no mercury removal when the flue gas temperatures at the FF inlet were 400 degrees F or more with an inlet dioxin concentration of 1600 ng/dscm, to 90 percent control when the FF temperature was below 300 degrees F with an inlet dioxin concentration of 240 to 900 ng/dscm. Outlet mercury emission concentrations ranged from 40 ug/dscm to 614 ug/dscm (Exhibit 1, Appendix A, p. 2-6). At other mass burn facilities with DSI/FF that had low inlet dioxin concentrations, low levels of mercury collection were estimated. These data suggest that in addition to low temperatures, carbon needs to be present in the fly ash in order to obtain mercury control (Exhibit 1, p. 2-7).

Spray drying in combination with ESPs and FF showed inconsistencies similar to DSI. Additionally, there is a difference in mercury concentrations between mass burn facilities and RDF facilities. (No data are available from a modular MWC system using SD/FF or SD/ESP.) Outlet mercury emissions at mass burn waste combustors with SD/ESPs range from 210 to 950 ug/dscm (Exhibit 1, Appendix A, p. 2-7). The RDF units that use SD/ESPs report lower outlet emissions, ranging from 5 to 105 ug/dscm (Exhibit 1, Appendix A, p. 2-7). The results from the RDF units support the theory that increased levels of carbon in the fly ash enhance mercury removal. Mercury emissions from SD/FFs range from below detection levels to 1275 ug/dscm. Mass burn facilities report average mercury concentrations of 10 to 1275 ug/dscm. The lowest outlet mercury concentrations and highest removal efficiencies occur at the RDF facilities using SD/FF, ranging from below detection levels to 50 ug/dscm.

Wet scrubbing at Minnesota's two MWCs show positive mercury reductions (Exhibit 1, p. 2-21). The City of Fergus Falls combusts MSW in a modular system, while WLSSD combusts RDF and sewage sludge in a fluidized bed combustor. These two facilities have measured mercury emission concentrations below 80 ug/dscm, indicating control of mercury.

The very low exit temperature of Fergus Falls' scrubber (160 degrees F), and the expected high amount of carbon in the flue gas (as suggested by the APCD outlet dioxin concentration of 438 ng/dscm) combine to provide significant mercury removals. This system has demonstrated mercury emissions of 25 ug/dscm. WLSSD had mercury emissions of less than 80 ug/dscm.

Summary

The variations in mercury removals at facilities with acid gas control can be attributed to combustion technology (e.g. mass burn versus RDF spreader-stokers); combustion efficiency of the combustor, which affects the fly ash carbon content; and the operating temperature of the air pollution control system. Good PM control, temperatures in the APCD system below the range of 300 to 400 degrees F, and significant carbon in the fly ash are necessary to achieve high levels of mercury control. The combination of a low PM control device operating temperature and a high level of carbon in the fly ash enhance mercury adsorption onto particles which are removed by the PM control device.

(e) Baseline Emissions from Minnesota MWCs

Results of the review of mercury emissions from MWCs in Minnesota are contained in Exhibit 1, Chapter 2. Removal efficiencies were inconsistent at Minnesota MWCs using ESPs for control. The ESPs are all operated at temperatures above 400 degrees F, such that mercury removal is not expected. The outlet concentrations at the MWCs with ESPs were therefore used to predict baseline uncontrolled mercury emissions from MWCs.

The average uncontrolled mercury emission concentrations at mass burn and modular waste combustors in Minnesota is 600 ug/dscm, and ranges from 300 to 1400 ug/dscm (Exhibit 1, pp. 2-14). The average uncontrolled mercury emission concentration from RDF facilities is 200 ug/dscm, and ranges from 100 to 360 ug/dscm (Exhibit 1, pp. 2-14).

In Minnesota, mercury emissions from facilities with SD/FF are well below levels reported nationally. HERC is a mass burn facility with a SD/FF, and as reported earlier, has an average mercury emission concentration of 110 ug/dscm. RDF combustors equipped with SD/FF achieve mercury emission concentrations below HERC. UPA has demonstrated a mercury concentration of less than 19 ug/dscm. NSP-Wilmarth shows mercury emissions of less than 3 ug/dscm.

Table 9. Summary of Average Emissions from Minnesota MWCs (Exhibit 1 pp. 2-14)

Combustor Type	**APCD**	**Avg. Hg conc (ug/dscm)**
Modular	ESP	600
Mass Burn	ESP	600
RDF	ESP	200
Mass Burn	SD/FF	100
RDF	SD/FF	20
Modular	WS	80
RDF	WS	80

RDF facilities show the lowest mercury emissions for possibly two reasons: waste processing has removed mercury sources in the waste stream, and/or because these facilities are suspension-fired units. When burning fuel in suspension, fuel is blown or flung into the combustion chamber. Part of the fuel burns "in suspension", while the remainder burns on the grate at the bottom of the combustion chamber. This burning technique results in very high particulate matter concentrations in the flue gas exiting the combustion chamber (Exhibit 4, pg. 4). This high PM loading means there may be higher carbon quantities in the flue gas. The higher carbon quantities are then available to remove mercury from the flue gas.

(2) Control Alternatives

Alternatives for the control of mercury focus on minimizing the discard of mercury into the waste stream and using add-on air pollution control technologies to reduce emissions. Combustion system operation modifications or controls do not at this point present an alternative for control of mercury emissions (Exhibit 1, pp. 3-8 to 3-12).

Several methods of post-combustor air pollution control methods are effective in controlling mercury emissions from both municipal and medical waste combustors. The most common control methods considered are adsorption with activated carbon and wet scrubbing. Additionally, sodium sulfide injection has been used in Europe and Canada for mercury control.

Eliminating mercury from the waste stream is the first means of reducing mercury emissions. Mercury use in disposable materials can be reduced, or the waste containing mercury can be separated prior to it being disposed.

(a) Waste Separation Programs

In situations where mercury-containing materials can be reliably removed from the waste stream, it would appear that materials separation prior to disposal is a viable option for reducing emissions. For example, mercury separation programs have been implemented at medical facility campuses, where the facility has control over the generation and disposal of wastes.

The applicability of separation programs to reduce mercury emissions from MWCs is less certain. Estimated participation rates in community battery collection programs are reported to be 3 to 10 percent. In Broward County, Florida, participation rates have not been carefully monitored, but are estimated at 25 percent (Exhibit 1, pp. 3-7).

In Minnesota, significant experience in separating mercury-bearing wastes from MSW has been gained in Hennepin County. Hennepin County has implemented a mercury waste separation program, which now includes button batteries, household batteries, rechargeable appliances/mercury-bearing products, and fluorescent lightbulbs. Curbside collection of batteries is provided within the City of Minneapolis. There are also 500 drop-off sites throughout the County for collecting batteries.

Since its inception in 1990, the County's program has collected approximately 200 tons of batteries, including 110 tons of alkaline batteries, 1 ton of mixed button batteries, and 0.5 tons of mercury oxide batteries.[11] Based on the sale of an estimated 1,350 tons of alkaline batteries and 2.2 tons of button cell batteries within the County (based on national average per capita sales data), it is estimated that the County's program is collecting about 10 percent of the alkaline batteries and 70 percent of the button cell batteries sold in Hennepin County (Ref. 126). Based on an estimated 730 pounds of mercury in the collected batteries, and an estimated MSW mercury concentration of 3 ppm, it appears that the County's battery separation program has removed approximately 13 percent of the mercury from the waste stream (Ref. 127). These levels appear comparable to other community collection programs where the removal rates were estimated at 3 to 10 percent.

This estimate does not take into account the efforts required of businesses and health care facilities by Hennepin County and state statutes to keep mercury out of the solid waste stream. Through the County's existing hazardous waste programs, industries, businesses, academic institutions and medical facilities have been informed of the battery bans, and have established battery separation programs on their own. For instance, Northwest Airlines collected about 15 tons of used alkaline batteries in 1992.[12] These did not test hazardous when tested with the TCLP test,

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11 Conversation between Ms. Cheryl Lafrano of Hennepin County and Ms. Anne Jackson of the MPCA, February 1993.

12 Conversation Between Ms. Karen Yeadon of Northwest Airlines and Ms. Anne Jackson of the MPCA, March 1993.

and so were landfilled. The University of Minnesota operates its own battery separation program, and has removed a significant quantity of mercury via its collection of button cells.[13]

Figure 6. Quarterly average mercury emissions measured at HERC MWC.

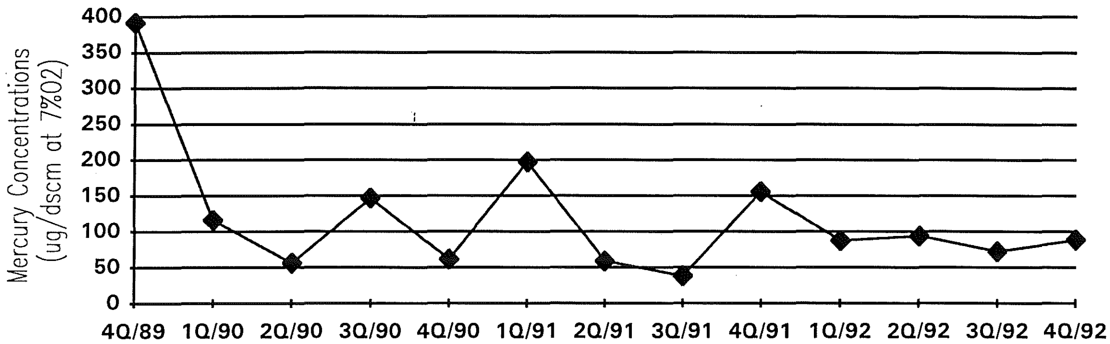

Figure 6 shows the results of mercury emissions testing conducted at HERC. Testing conducted through 1990 was done using Method 29. Testing conducted after 1990 has been done using Method 101A. Note that there appears to have been a decrease in the variability of quarterly averages. However, the median (middle) mercury emission concentrations for each of HERC's first three years of operation was 68, 56, and 106 ug/dscm respectively, suggesting the lack of a downward trend in average mercury emissions (Ref. 128).

Mercury concentrations at the inlet and outlet to the SD/FF at HERC during the single test series was conducted at HERC with Method 29 in early 1990. Inlet emissions were measured at 47.7 ug/dscm, and outlet emissions at 18.8 ug/dscm. This indicates a mercury removal efficiency of about 60 percent. Compared to mercury emissions from other mass burn facilities using SD/FF, HERC's average overall mercury emission concentration of 110 ug/dscm (or about 140 ug/dscm with Method 29) is about one-third to one-half lower than the mercury emissions from other similar

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13 Conversation between Mr. Gene Christensen of the University of Minnesota and Ms. Anne Jackson of the MPCA , March 1993.

facilities (Exhibit 1, Appendix A, Table 2-1, pp. 2-3 to 4). Based on the overall outlet concentrations and a 50 percent removal efficiency, uncontrolled mercury concentrations at HERC are expected to be significantly lower than other mass burn facilities. This overall lower mercury inlet concentration suggests that mercury waste separation programs may be having a positive effect in overall mercury emission reductions.

A decrease in the 95th percentile (the value for which 95 percent of the data is below) of HERC's mercury emissions for each year has been estimated (Ref. 129). The 95th percentile for each of the plant's first three years' mercury emissions is 480, 230 , and 190 ug/dscm (Ref. 130), suggesting that the spikes from combusting high mercury-content wastes are becoming lower. Based on these data, the mercury waste separation programs appear to be useful in reducing the spikes that are detected during emissions testing.

Because of recent statutory restrictions on the use and disposal of products that contain mercury, the mercury content of the waste stream is decreasing, so resulting mercury emissions can be expected to be lower. Combined with a mercury waste separation plan, mercury emissions from waste combustors will decrease. Additionally, it is proposed elsewhere in this rulemaking that Class A, B and C waste combustors demonstrate compliance with the emission limits within three years from the effective date of the rule. As a result, these waste combustor facilities have three years to implement a waste separation program and undertake air emission testing to determine whether further actions are necessary to achieve mercury emission limits.

Further, proposed testing requirements allows a permittee to perform more stack sampling of mercury emissions during each stack sampling event. This allows the permittee to use more data points to determine compliance with emission limits. The use of more samples decreases the width of the confidence interval, resulting in a better prediction of mercury emissions. A permittee may choose to conduct more samples if results are expected to be close to the emission limit.

(b) Activated Carbon

The mercury control technology receiving the most attention is injection of powdered activated carbon prior to a waste combustor's air pollution control system. Another option is to pass the flue gases through a bed of activated carbon or coke.

Activated carbon is a specialized form of carbon produced from coal or other vegetative materials. Activated carbon has a complex internal pore structure with a high specific surface area and is capable of adsorbing a wide range of contaminants, including mercury.

EPA conducted testing at the Stanislaus County MWC to determine the effects of activated carbon injection on mercury emissions. Sixteen separate test conditions were evaluated to determine baseline conditions and the effects of various types of carbon and carbon injection rates, as well as to evaluate test methods for measuring mercury emissions (Ref. 131).

Three carbon concentrations in the flue gas, termed "low" (18 ug/dscm of activated carbon in the flue gas), "medium" (36 ug/dscm activated carbon) and "high" (72 ug/dscm activated carbon) were evaluated. At the high carbon feed rate, mercury emissions measurements collected using EPA Method 101A averaged 40 ug/dscm. The highest mercury emission concentration was 80 ug/dscm at the high carbon feedrate. At this feedrate, mercury reductions were consistently greater than 85 percent, and the average mercury reduction rate was greater than 90 percent (Ref. 132). The testing showed that at the low carbon feedrate, there is significant variability in outlet mercury concentrations and mercury removals, but the variability decreases when the amount of activated carbon used increased.

Also, for high carbon feedrates, the outlet mercury concentration is relatively insensitive to inlet values. At the high carbon feedrates, reduction of inlet mercury concentration from 600 to 400 ug/dscm is predicted to result in a reduction in outlet values from 47 ug/dscm to 41 ug/dscm (Ref. 133).

(c) Sodium Sulfide Injection

The injection of sodium sulfide (Na_2S) into the flue gas prior to particulate matter capture has been tested in Europe and Canada for mercury control. Sodium sulfide (Na_2S) is sprayed into the flue gas upstream of a fabric filter and converts mercury and mercury chlorides according to the following reactions:

$$Na_2S.H2O + Hg\ (elemental) \Longrightarrow HgS + NaOH$$

$$Na_2S.H2O + HgCl_2 \Longrightarrow HgS + 2\ NaCl.H_2O$$

Mercuric sulfide is a solid at baghouse temperatures, thus is captured in a fabric filter.

The Burnaby facility in Vancouver, is a mass burn facility that tested sodium sulfide injection for mercury control. Burnaby has a DSI/FF system. Sodium sulfide injection showed a removal efficiency of 75 to 95 percent (70 to 160 ug/dscm). At Hogdalen, Sweden, another mass burn facility. Mercury removal efficiencies were 85 to 95 percent (25 to 60 ug/dscm). Because of the insolubility of mercuric oxide, however, there have been questions raised regarding the possibility of over-estimation of actual removal efficiency. Using Na_2S with other types of control equipment has not been tried.

There are potential problems with handling Na_2S that may affect plant and community safety. When heated, Na_2S will off-gas hydrogen sulfide, a very odorous, toxic gas. With proper equipment design and operator training, problems with off-gassing have not been reported with the MWCs using Na_2S. However, it may present a problem at medical waste incinerators where operating staff may be less trained or have less time to dedicate to the equipment.

(d) Wet Scrubbing

Absorption is a widely used and accepted method for acid gas control. Absorption is an operation in which one or more components of a gas mixture are selectively transferred into a relatively nonvolatile liquid. Physical absorption occurs when the absorbed compound simply dissolves in the solvent. When there is a reaction between the absorbed compound and the solvent, it is termed chemical absorption.

Water used for acid gas control is one means of providing absorptive material for vapor control. Solvents that can be used for mercury control include water and hypochlorite solutions (Ref. 135).

As a stand-alone control technology, wet scrubbing can be used to control acid gases, PM, and metal emissions from MWCs. This technology is used in Europe and Japan, but is not a widespread practice in the United States, where dry scrubbing systems predominate. Wet scrubbers can be used as an additional technology downstream of PM control equipment to achieve further flue gas cooling and condensation of volatile materials, including mercury.

Due to the low absorber operating temperature that promotes mercury condensation, wet scrubbing can achieve significant reductions of some mercury compounds. Some mercury compounds, most notably elemental mercury (Hg^0), are relatively insoluble and are only partially removed by wet scrubbing. Based on mercury species expected in MWC flue gas, mercury reductions by wet scrubbing of 90 percent or greater may be achievable. To stabilize condensed mercury compounds in the scrubber liquor, liquid chelating agents must be used, otherwise revolitalization can occur, lowering the effectiveness of wet scrubbing (Exhibit 1, pg. 5-12).

Use of a wet scrubbing system raises concerns about reduced control of other toxic emissions. Part of this concern is due to the reduced ability of a wet scrubber to collect fine particulate matter, allowing metal-enriched PM to exit with the flue gas. Additionally, evidence is growing that wet scrubbers can dechlorinate dioxins, increasing their toxicity (Refs. 136 and 137).

(3) Development of Emission Limits

Due to the variability of emissions, measured mercury emissions values during a compliance test will be higher or lower than average values. From the perspective of developing air emission limits that are enforceable, consideration must be given to what can be achieved with certainty when following very specific compliance testing procedures.

The MPCA's overall goal of establishing a mercury emissions limit for waste combustors is to reduce the emissions of mercury to the environment. To achieve this goal, the emissions must be achievable using present technology. While the regulatory limits should reflect the ability of waste management procedures and air pollution control equipment to achieve significant mercury reductions, they should also recognize that mercury emissions can vary due to waste stream variations and test methods used.

With these goals in mind, a three-tiered mercury limit for various waste combustor/air pollution control technology combinations is proposed. First, for each waste combustion technology, a short-term standard is established that reflects the upper value of emissions that may occur during each compliance test of a well-operated system. Second, a long-term emission limit is established that is a more stringent emission limit based on the arithmetic average of tests conducted during the previous calendar year. The objective of this second limit is to more accurately reflect the long-term average emission rate by minimizing the influence of an individual sampling run.

The third tier of the standard, a percent removal requirement, recognizes that because of the variability in mercury emission concentrations in different waste materials, a facility may exceed an emission limit (i.e. the concentration limit in ug/dscm) even when the control system operates very efficiently. Inlet and outlet concentrations would have to be measured concurrently in order to determine compliance with this type of standard, much like the removal requirements proposed for sulfur dioxide and hydrogen chloride. The achievable emission limits are presented in

Table 10. For each control technology, the development of both the short-term and the long-term emission limitation is presented.

Table 10. Achievable Mercury Emission Limits for Municipal Waste Combustors

Combustor Type	APCD	3-Run Limit (ug/dscm)	Four 3-run Limit (ug/dscm)	Percent Reduction Limit
All	ESP	1,000	600	none
Mass burn, Modular, FBC	Wet or Dry Scrubber	100	60	85%
RDF	Wet or Dry Scrubber	50	30	85%

(a) Short-Term Limit

Uncontrolled mercury emissions are variable due to the nature of mercury in the waste stream. This means that when emissions testing is conducted, some concentrations will be higher, and some will be lower than the average. To account for this variability, a short-term emission limit is proposed. This limit is intended to represent the upper level of mercury emission concentrations achievable by a well-operated MWC that would be measured with a high degree of confidence during any single testing event. The proposed part 7011.1265 allows a facility to collect a minimum of three samples per test. Mercury emissions measured above the concentrations of the short-term limit would indicate that the system has emitted higher levels of mercury that would be expected on a very infrequent basis.

In order to ensure measurement precision, particularly at the low mercury emission levels already demonstrated by some of Minnesota's MWCs, proposed part 7011.1265 requires a facility to use Method 29 to collect and analyze flue gas for mercury. Each test run may be up to two hours long. Mercury measurements collected at the Stanislaus facility indicates that mercury measurements obtained from sequential one-hour tests conducted on the same day are independent of each other. This means that the variability of measured mercury concentrations calculated using "N" averages based on three one-hour emission tests will be the same as from using "N" three-hour tests. Collecting three two-hour samples has the same expected variability as collecting six one-hour samples.

(i) Electrostatic Precipitators

As discussed in section 1(d) of this part, the average uncontrolled mercury emission concentration from mass burn and modular waste combustors in Minnesota is 600 ug/dscm. The range of emissions is from 300 to 1400 ug/dscm. No control of mercury is expected without reducing the flue gas inlet temperatures below the operating temperatures of ESPs. Achievable mercury emission concentration limits from MWCs using only ESPs reflect those emission concentrations achievable with the use of waste separation programs. Mercury emissions from Minnesota MWCs, in particular spikes caused by combusting high-mercury concentration wastes, can be reduced with the implementation of mercury waste separation programs, as evidenced at HERC. Therefore, the short-term mercury concentration limit achievable for MWCs using ESPs is proposed at 1000 ug/dscm.

Given that mercury waste separation programs and statutory mercury disposal restrictions reduce mercury emissions and that the facilities have sufficient time to plan methods to meet the mercury emission limit, as well as the flexibility in sampling flue gases to determine compliance with the limit, the proposed limit is believed reasonable.

(ii) Wet or Dry Scrubbing Systems

Wet or dry (both dry sorbent injection and spray drying) scrubbing systems can reduce mercury emissions with the use of stabilizing agents or activated carbon injection (Exhibit 1, pg. 5-12). When a waste combustor uses an air pollution control system that incorporates dry scrubbing, activated carbon injection systems can be used to further reduce mercury emissions.

The mercury concentration emission limit was developed based on the results of the testing of activated carbon injection at Stanislaus County. A statistical analysis of the data was completed by White and Nebel in 1992, and is contained in Exhibit 1, Appendix B. The objective of this analysis was to determine, with a specified degree of confidence, what mercury concentration and removal efficiencies are consistently achievable for mass burn and modular MWC's using activated carbon injection. This analysis considered three different statistical methods to estimate control levels. The conclusions of this analysis was to use the t-statistic because it takes into consideration the small size of the sample set (Exhibit 1, Appendix B, pg. 17).

The t-statistic is used to predict confidence limits on a small sample population. Both the 95 and 99 percent upper confidence limit (UCL) for outlet mercury concentration and mercury removal based on the Stanislaus County test data were determined. The 99 percent UCL can be viewed as the value within which 99 of 100 future observations will occur (or, for the 99 percent UCL, 99 of 100 observations). The 99 percent UCL equates to a potential exceedance of one quarterly event in 25 years (i.e., 100 quarters).

As shown in Table 11, with the use of a high carbon feedrate, a one-hour sampling run with Method 29, and the collection of three sample runs to compute an average emission concentration, the 99 percent UCL concentration value is 103 ug/dscm. If six one-hour samples or three two-hour samples are taken to determine average mercury emissions during the sampling event, the 99 percent UCL concentration value drops to 89 ug/dscm (Exhibit 1, pg. 5-10).

Table 11. 99th percentile Concentration Confidence Limits (μg/dscm) at High Carbon Feedrates

Sample Size (No. of Test Runs)	**Method 29**	
UCL	95%	99%
3	86	103
6	77	89
10	73	82

Based on these values, the proposed mercury emission limit for mass burn or modular MWC facilities using activated carbon, is 100 ug/dscm.

This emission limit can be achieved by a mass burn or modular MWC using a wet or dry scrubber, adding sufficient carbon or other sorbent to the flue gas stream, and maintaining an aggressive waste separation program. Under these conditions, the 100 ug/dscm short-term standard will be achieved by massburn or modular facilities with scrubbing equipment. Indeed, two MWCs operating in Minnesota with scrubbing, HERC and the City of Fergus Falls, have achieved this short term emission limit, without carbon injection. Mercury emission testing at HERC in the last 365 days is shown below in Table 12. The City of Fergus Falls conducted mercury emissions testing in 1989 with Method 29, and showed mercury emission concentrations of 25 ug/dscm.

Table 12. Adjusted Mercury Emissions at HERC (μg/dscm)*

Test Event	Unit 1 Emissions	Unit 2 Emissions
August, 1992	113.15	90.3
November, 1992	138.5	97.5
February, 1993	100.0	64.4
June, 1993	63.1	53.6
Annual Average	**103.6**	**76.5**

*Method 101A results were adjusted by adding 30 ug/dscm to represent expected results using Method 29.

(iii) RDF Combustors

Overall emissions from Minnesota's RDF facilities using scrubbing are considerably lower than similar-sized mass burn and modular facilities (Exhibit 1, p. 2-7). In Minnesota, the highest measured uncontrolled mercury emission concentration from RDF facilities is about one quarter of the level from massburn and modular waste combustors (364 ug/dscm at RDF facilities vs. 1400 ug/dscm at massburn/modular systems). In addition, RDF combustors have higher levels of unburned carbon in fly ash and higher mercury reductions across SD/FF systems. The lower uncontrolled mercury concentration and the higher inherent mercury reduction for RDF facilities allows establishment of a lower achievable mercury concentration limitation.

Activated carbon injection at Stanislaus County achieved an average removal efficiency of at least 85%. The proposed short-term mercury concentration limit for RDF facilities was developed based on removing 85 percent of the uncontrolled mercury concentrations from RDF combustors, meaning that RDF facilities can achieve a short-term emission concentration of 50 ug/dscm.

Minnesota's RDF/SD/FF waste combustors have demonstrated the ability to achieve this emission limit. Retrofitting activated carbon injection and flue gas scrubbing will provide for achievement of this emission limitation at Minnesota's other RDF combustors. The proposed limit, therefore, is a reasonable emission limit for RDF combustors.

(b) Long-Term Limit

Because mercury affects humans and wildlife via buildup in the foodchain, the long-term emission concentration limit is important for assessing environmental impacts. Exceedance of a short-term emission limits may indicate facility operation failure or very high mercury concentrations in the waste stream, but because of the variability of mercury emissions, the exceedance may not indicate whether environmental harm resulted from that event. The MPCA therefore has developed a "long-term emission limit". Compliance with this emission limit will ensure that the atmospheric loading from waste combustors is minimized to the maximum extent possible, and most accurately represents overall emissions to the environment.

Since, mercury emission tests must be conducted at least every 90 days (or every 15 months for RDF combustors) according to Minn. Stat. § 116.85 (1992), the average of the testing conducted in the prior calendar year has been selected to represent the long-term emission concentration. A calendar year has been selected so that potential seasonal variations are accounted for in the computation of an average emission, and so that a rolling average can be determined. A rolling average means simply that every time a measurement is made, the new measurement replaces the oldest value of the previous calendar year. Thus, the average "rolls" as data is generated.

(i) Electrostatic Precipitators

The long-term emission limit proposed for mass burn or modular combustors using ESPs is 600 ug/dscm. This value represents the average mercury emission concentration achievable by this air pollution control technology at mass burn and modular MWCs. If the facility works to ensure that a reasonable mercury waste separation program is in place, short-term mercury emission concentrations will be reduced. This will lower the magnitude of mercury concentration spikes, which then lowers the values that are used to calculate the long-term emission concentration.

(ii) Wet or Dry Scrubbing

The proposed long-term emission limit for mass burn and modular waste combustors using scrubbing combined with activated carbon injection is 60 ug/dscm. This value corresponds to a 90 percent removal efficiency, an average uncontrolled mercury concentration of 300-350 ug/dscm, and the expected variability in measured mercury levels observed at Stanislaus County. The uncontrolled levels of 300 to 350 ug/dscm are supported by mercury emissions testing conducted at Olmsted County's mass burn facility in May, 1993. This facility has an ESP, so is not expected to have any mercury control. Average mercury emissions were 312 ug/dscm, ranging from 237 to 399 ug/dscm[14].

In light of the lower uncontrolled mercury levels observed at Minnesota MWCs, expected reductions in both the average mercury concentrations and the variability in measured levels expected from reduced mercury levels in batteries and from material separation programs in

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14 Dunnette, Rob. Facsimile transmission of metals testing results conducted at Olmsted County, May 1993 by TRC Environmental Corporation. July 23, 1993.

the state, and on the demonstrated performance of activated carbon to reduce mercury levels in MWC flue gas, the proposed limit of 60 ug/dscm is a reasonable emission limit for these combustors.

(iii) RDF Combustors

The proposed long-term emission limit for RDF combustors is the lowest of the long-term emission limits, and reflects the ability of these facilities to achieve very low mercury emission concentrations (Exhibit 1, pg. 2-20).

The proposed long-term emission limit is 30 ug/dscm. This level is already being achieved by SD/FF-equipped RDF units elsewhere in the United States (Nebel and White, 1991 in Exhibit 1, Appendix A). Given projected decrease in the mercury content of the waste stream, a 30 ug/dscm long-term limit is reasonable for RDF units in Minnesota. At lower concentrations, however, concerns about the detection limit and variability in Method 20 measurements become significant, and therefore would complicate enforcement of the standard.

If the combustor owner or operator is concerned that compliance with the emission limit may not be met, the combustor owner or operator can choose to collect samples over a longer period, as allowed in proposed part 7011.1265 Performance Test Methods. Collecting larger samples for analysis allows the achievement of lower detection levels.

(c) Percent Removal Efficiency

Because of the variability in mercury emission concentrations in different waste materials, a facility may exceed an emission concentration limit, even when the control system is operated very efficiently.

For MWCs using scrubbing and activated carbon, the third part of the standard allows a facility to demonstrate compliance with this requirement by conducting concurrent testing at both the inlet and the outlet of the air pollution control system during a compliance test. If the facility is able to consistently meet the emission limit, inlet sampling would not be necessary. If the facility is concerned about exceeding outlet concentration limits due to uncontrollable spikes, then the facility can choose to demonstrate that at least 85 percent of the mercury was removed.

The percent removal efficiency was determined based on the ability of high carbon feedrate concentrations to remove mercury at Stanislaus County, and the statistical analysis previously described (Exhibit 1, Appendix B). Table 13 shows the results of the computation of the lower confidence limit of the mercury removal percentage when using activated carbon injection at the high carbon feedrates. Using Method 29 and collecting 3 one-hour runs to determine the average removal efficiency results in a 99 percent lower confidence limit (LCL) value of 82 percent removal (the removal efficiency of 99 of 100 observations will be greater than 82 percent). If six one hour samples or three two-hour samples are collected, then the 99 percent LCL is 85 percent removal.

Table 13. Percent Reduction Confidence Limits at High Carbon Feedrates

Sample Size (No. of Test Runs)	**Method 29**	
LCL	95%	99%
3	85	82
6	87	85
10	88	86

It is proposed that the facility demonstrate achievement of a removal efficiency of at least 85 percent, if the concentration emission limits are exceeded. As discussed above, it is expected that MWCs in Minnesota will comply with the emission concentration requirements in most cases and will need to demonstrate compliance with the percent reduction requirement infrequently. Given this situation and the data on achievable emission reductions from scrubbers equipped with carbon injection, it is reasonable that waste combustors with mercury control equipment demonstrate that at least 85 percent of the mercury was removed from the stack gases when an emission limit is exceeded.

The procedure for mercury compliance determination in part 7011.1265, subp 3, item C describes the order in which the emission limits apply. First, the concentration limit is applied. If the concentration limit is not met, the minimum removal efficiency is applied. There are two reasons for proposing an ordered compliance determination method. First, an ordered compliance determination method establishes that the preferred emission limit is the concentration limit. The concentration emission limit establishes a ceiling for total mercury emissions from a waste combustor, a minimum removal efficiency does not. Second, as discussed in this SONAR, the quantity of mercury in the waste stream is expected to decrease over time. With a decreasing amount of mercury in the waste stream, it will become increasingly difficult for waste combustors to comply with a removal efficiency limit even when operating the system at maximum performance.

The removal efficiency provision is not available to waste combustors that use only ESPs for control. If there is an exceedance of either the long-term or short-term emission limitation, these facilities will be subject to enforcement action to ensure that no future exceedances occur. Because these facilities are not required to install acid gas and mercury control equipment in this rulemaking activity, they are relieved of significant capital and annual costs associated with complying with the requirements of the rule. Relieving these facilities of these costs, however, means that they are not able to take advantage of the provision in the tiered compliance requirements.

8a. Reasonableness of Part 7011.1227--Standards of Performance for Class A and B Waste Combustors

Table 1 in proposed Part 7011.1227 contains the emission limitations for existing waste combustors that are determined to be a Class A, B or C waste combustor. In Minnesota, there are twelve municipal waste combustors that fall into one of these three classifications. HERC and UPA are potentially Class A facilities, based on their rated heat input from waste. NSP's two waste combustors--Red Wing and Wilmarth in Mankato, are potentially Class B waste combustors.

Olmsted County, Quadrant Co, Polk County, City of Red Wing, Pope-Douglas, Richards Asphalt, the City of Fergus Falls, and Western Lake Superior Sanitary District all own and operate Class C waste combustors. At the time of permit reissuance, the class of the facility will be confirmed.

Figure 7 provides a map of the facilities locations.

On February 11, 1991, EPA promulgated standards of performance for new municipal waste combustor units capable of processing 250 TPD and greater (Class I), and emission guidelines for existing municipal waste combustor facilities with a processing capacity of 250 TPD and greater (Classes A and B). These standards (40 CFR 60, Subparts Ea and Ca respectively) represent EPA's determination of best demonstrated technology (BDT). A summary of the emission guidelines as promulgated for existing MWCs is presented in Table 14. At the same time that these standards were promulgated, EPA announced its review of those standards to determine whether they are consistent with MACT as defined and required by Section 129 of the Act (56 FR 5517, 2/11/91).

Figure 7.

Operating Municipal Waste Combustors

Permitted on December 20, 1989

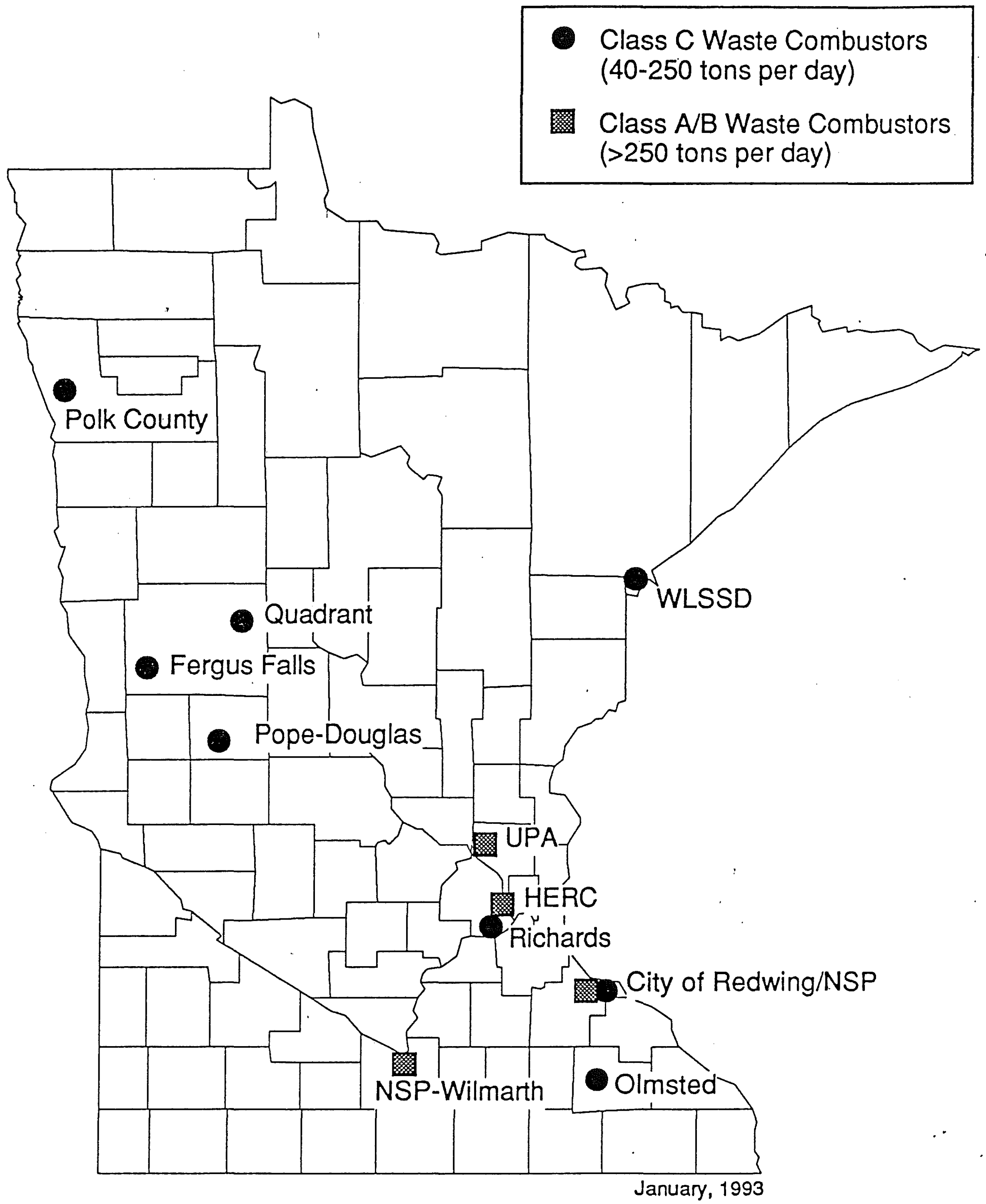

Table 14. EPA Emission Guidelines (40 CFR Part 60 Subpart Ca)
All emissions corrected to 7% O_2

	Large MWCs	Very Large MWCs
Particulate Matter	0.030 gr/dscf	0.15 gr/dscf
Opacity	10%	10%
Dioxins		
All Facilities, except RDF Stokers and coal/RDF mixed fuel	125 ng/dscm	60 ng/dscm
Large RDF stokers and coal/RDF mixed fuel	250 ng/dscm	60 ng/dscm
Acid Gases (percent reduction or parts per million by volume, whichever is less stringent)		
Sulfur Dioxide	50% or 30 ppmv	70% or 30 ppmv
Hydrogen Chloride	50% or 25 ppmv	90% or 25 ppmv
Carbon Monoxide (by technology type, not size)		
	Emission Concentration	Averaging Time
Mass burn Waterwall	100 ppmv	4 hours
Mass burn Refractory	100 ppmv	4 hours
Mass burn Rotary Waterwall	250 ppmv	24 hours
Modular Starved Air	50 ppmv	4 hours
Modular excess air	50 ppmv	4 hours
Refuse Derived Fuel Stoker	200 ppmv	24 hours
Bubbling fluidized bed combustors	100 ppmv	4 hours
Circulating fluidized bed combustor	100 ppmv	4 hours
Coal/RDF mixed fuel-fired combustor	150 ppmv	4 hours

EPA emission limits that reflect the use of the best demonstrated technology for reducing MWC emissions at existing Class A (very large) plants are based on the use of good combustion practices, and a spray dryer followed by an electrostatic precipitator (ESP). EPA's emission limits for existing Class B (large) plants are based on the use of good combustion practice and dry sorbent injection followed by an ESP (DSI/ESP). No mercury standards were promulgated however. EPA announced at the same time as promulgation of the standards the start of rule making to develop mercury, lead and cadmium emission limits for these facilities.

a. MACT Floor for Large Waste Combustors

Since promulgation of the emission guidelines, EPA has undertaken their review to determine the MACT floor for MWCs, and has reported that 31 percent of existing large waste combustors (all combustors in both large and very large categories) have SD/FF systems, which are the most efficient at controlling waste combustor emissions.[15] More than 12 percent in this category use good combustion practices (GCP). The MACT floor is therefore potentially defined as spray dryer/fabric filter air pollution control equipment with good combustion practice. Under Section 129 of the CAA, air pollution control equipment system represented by the MACT floor must be used to establish emission limits, and equipment installed and operated must meet this level of performance.

The chosen method for acid gas control will probably require the use of a spray dryer (SD) instead of dry sorbent injection (DSI) for existing MWCs. This is a result of the fact that no large or very large waste combustor uses dry sorbent injection.[16] Zero percent is less than 12 percent, therefore DSI does not represent the MACT floor.

Since DSI/ESP probably cannot be considered by EPA to represent the MACT floor, EPA will need to amend its promulgated emission guidelines to conform with the CAA. This activity was to occur by 1992 under the CAA, but has not. While the MPCA cannot say for certain when EPA will actually promulgate amended guidelines, those revisions will likely occur within the next several years. It is certain that the MPCA would need to revise emission standards to be more restrictive for Class B if the MPCA were to adopt DSI/ESP standards now. Lowering emissions in a stepwise fashion (by imposing DSI/ESP standards now and SD standards later) would not lessen the economic burden on the Class B facilities, because the technologies between those steps are dissimilar. The selection of DSI for acid gas control at existing Class B facilities will no longer be given consideration here. This means that no further consideration will be given to the selection of standards for these facilities based on DSI/ESP or DSI/FF.

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15 Stevenson, Walter. Third International Conference on Municipal Waste Combustion. Williamsburg, VA. March 30 to April 2, 1993.

16 Stevenson, Walter. Third International Conference on Municipal Waste Combustion. Williamsburg, VA. March 30 to April 2, 1993.

b. Selection of Level of Control for Minnesota Facilities

On a statewide basis, seven of nine MWC units in the large and very large category (Classes B and A) use spray dryers for acid gas control. The installation of this equipment at MWCs in Minnesota resulted from the permit development for each facility, based on review of risk assessment results, and review of controls being installed in the United States at similar-sized facilities. Because most Minnesota Class A and B waste combustors already have spray dryers, and the federal emission standards will require the use of spray dryers, it is reasonable that at a minimum, spray drying be evaluated for control at these waste combustors.

Many municipal waste combustors constructed just prior to the proposal date for the current new source performance standard (40 CFR 60, Subpart Ea) were built with large ESPs. When retrofitted with spray dryers for acid gas control, ESPs are capable of performance levels that are very close to the levels achievable by sprayer dryer/fabric filter combination air pollution control equipment, as shown in Table 15. This table presents a description of the levels of performance of a SD/ESP and SD/FF system. Achievable particulate matter and dioxin concentrations are very similar. Removal of metal emissions (other than mercury) ranges from no difference between a SD/ESP and SD/FF up to a three percent difference between the two. The largest difference between the two methods of controlling emissions is the ability of the equipment to remove sulfur dioxide (SO_2). Spray dryer/fabric filters systems are more efficient at removing SO_2 (80% removal efficiency) than SD/ESP systems (70% removal efficiency); this is due to the fabric filter cake's ability to further neutralize SO_2 in the flue gases (filter cake is the buildup of PM and lime on the filter fabric).

Table 15 Spray Dryer/Electrostatic Precipitator Performance vs. Spray Dryer/Fabric Filter Performance at Existing MWCs

Pollutant	SD/ESP	SD/FF
SO_2	70% Removal	80% Removal
Particulate Matter	0.015 gr/dscf	0.015 gr/dscf
Metals Removal		
(As, Cd, Cr, Ni, & Pb)	95% - 98%	98% - 99%
PCDD/PCDF	5 - 20 ng/dscm	11 - 22 ng/dscm

It is possible that EPA may impose MACT standards that would require removing ESPs that are in good condition and replacing them with fabric filter particulate matter control equipment. Rather than adopting SD/FF for all waste combustors of this size, EPA may consider adopting standards that reflect the date of facility start-up and type of control equipment in use at that time. Because of the uncertainty of the choice of particulate matter control (ESP vs. FF), the MPCA considered what impacts might be realized in Minnesota by EPA's decision of what technology constitutes MACT.

As described earlier, there are four facilities that are potentially Class A and B: UPA's plant in Elk River, HERC's plant in Minneapolis, NSP's Wilmarth plant in Mankato, and NSP's plant in Red Wing. HERC is a mass burn waterwall waste combustor, the remaining three are RDF combustors. Only NSP Red Wing is without scrubbing equipment, using a very large ESP for particulate matter control. The remaining three waste combustors use SD/FF for control.

(1) Environmental Impacts

With the basis of control for all facilities being SD/ESP, which represents an SO_2 removal efficiency of 70 percent, potential SO_2 emissions from all of Minnesota's Class A and B facilities goes from 1221 tons per year under current conditions to 541 tons per year, for an overall reduction of 680 tons per year of SO_2. If the basis for control for all facilities was SD/FF, the SO_2 removal efficiency would be 80 percent for all facilities, representing potential SO_2 emissions from

Class A and B facilities of 442 tons per year, for an overall reduction of 779 tons per year from current conditions.

In comparison, in 1991, sources in Minnesota emitted 105,600 tons of SO_2.[17] The difference in the amount of SO_2 removed between standards based on SD/FF versus SD/ESP is about 100 tons, or .09 percent of the state's overall SO_2 emissions.

EPA concluded that SD/ESP as a retrofit technology is not capable of achieving the same level of control for dioxins as SD/FF, and promulgated dioxin emission concentration limits of 60 ng/dscm for existing very large MWCs (40 CFR Part 60.34a). As will be discussed in the selection of dioxin limits for Class A and B facilities, in Minnesota, a dioxin emission limit of 30 ng/dscm for these facilities is proposed. This emission concentration level is achievable at Minnesota facilities, even with the use of a SD/ESP. There is no improvement in the environmental impacts from dioxin emissions between the selection of SD/ESP or SD/FF.

Mercury emission limits are being proposed based on the use of activated carbon injection. Recent testing at Camden County mass burn SD/ESP facility of activated carbon injection demonstrates that a SD/ESP can meet the mercury emission limits proposed in this rule (Ref. 138). There is no improvement in the environmental impacts from mercury between the selection of SD/ESP and SD/FF.

As there is no environmental improvement with the use of SD/FF over SD/ESP, it is unreasonable to propose SD/FF standards.

(2) Ash Quality Impacts

In order to achieve high SO_2 removal efficiencies, large amount of lime (stoichiometric ratios greater than 3:1) are necessary (Ref. 139). Large amounts of unreacted lime end up in the fly ash, where the lime is then available to raise the pH of leachate that may form. At

17 Kim Sandrock , Air Quality Division. SO2 Emissions based on 1991 Emissions Inventory.

high pH, certain metals captured in the fly and bottom ash, like lead, may become more leachable. It is unreasonable to increase ash disposal concerns for very small benefits from the removal of small amounts of SO_2.

(3) Cost Impacts of Acid Gas Control Levels

Demonstrated performance of these facilities is shown in Table 16. UPA and NSP-Wilmarth currently show less than 60 percent SO_2 removal with the use of SD/FF. These facilities have HCl limits, and do not currently have SO_2 removal or emission concentration limits in their permits. These facilities have demonstrated at least 90 percent removal of HCl from the combustors' flue gases, but less than 60 percent SO_2 removal efficiencies.

Table 16. Demonstrated Emissions Acid Gas Performance at Class A/B Facilities

Facility	EPA Class	MPCA Class	APCD	PM conc.	SO_2 Rem.	HCl Rem.
UPA	VL	A	SD/FF	0.0123	56.4	94.5
HERC	VL	A	SD/FF	0.01	84.5	99+
NSP-Wilmarth	L	B	SD/FF	0.016	56.4	98.1
NSP-Red Wing	L	B	ESP	0.027	none	none

MPCA staff conducted interviews with the facility owners to determine the existing capacity of the Class A and B facilities for SO_2 removal. UPA has evaluated its existing system, and believes that an operational change would allow the facility to achieve SO_2 removal efficiencies of 70 percent. Lime and water use at the spray dryer could be increased without additional capital expenditures. The amount of lime currently used would be doubled. O&M costs would increase to purchase more lime, and to dispose of additional ash. and is estimated at $250,000 per year. This equates to an increased operating cost of approximately $0.77/ton of waste processed.

To achieve SO_2 removal efficiencies greater than 80 percent, UPA operators believe that they need to revise their fly ash handling system to handle more ash that will be wetter. The type of bags used would be changed, and the ducting and fan system would need to be modified. A larger spray dryer unit may need to be constructed as well. The total capital cost of this project is estimated at $6 million. The annual operating cost would be $600,000 (including debt retirement) for this system.[18] This equates to an increased operating cost of approximately $1.85/ton of waste processed.

NSP's Red Wing facility will require the installation of acid gas control equipment. At NSP Wilmarth, similar steps to those discussed for UPA are necessary to achieve increasingly higher levels of SO_2 control. The estimated cost to upgrade NSP Wilmarth are based on the estimated cost to upgrade UPA. It is reasonable to base the estimated cost to upgrade NSP Wilmarth on the estimated cost to upgrade UPA because similar activities are necessary, both systems currently have the same SO_2 removal efficiencies, and both systems are RDF/SD/FF. The estimated UPA costs were scaled down to account for the lower processing capacity of NSP Wilmarth. Table 17 summarizes the estimated capital cost to upgrade the Class A and B waste combustors in Minnesota with various air pollution control equipment.

In order to be reasonable, therefore, the MPCA must consider the cost of requiring upgraded acid gas controls as well as recognizing what might happen on the federal level. In order to determine the most cost effective control option, a matrix (Table 17) was developed to determine the cost of complying first with the MPCA standards, then the federal standards.

Table 17. Capital Costs to Upgrade Class A and B waste combustors (Thousands 1992 Dollars)

	SD/ESP/Hg Capital Cost	**SD/FF/Hg Capital Cost**	**Cost to Upgrade SD/ESP/Hg to SD/FF/Hg**	**Activity needed to meet SD/FF/Hg**
NSP Red Wing	$19,000	$29,610	$10,000	Cost to purchase and install FF
			$3,000	Value of ESP to be replaced
			$500	Cost to demolish ESP
UPA	$4,213	$10,213	$6,000	Cost to add larger SD
NSP Wilmarth	$1,904	$5,904	$4,000	Cost to add larger SD
HERC	$2,696	$2,696	$0	No mod. needed
TOTAL	**$27,813**	**$48,423**	**$23,500**	

18 Telephone Conversation Between Mr. Steve Schurtz of UPA and Mr. Michael Mondloch of the MPCA on February 4, 1993.

If MPCA and EPA promulgate the same standard applicable to these units, there is no extra expense in bringing the waste combustors into compliance with both state and federal standards. If, however, the MPCA promulgates acid gas control standards based on SD/ESP, and EPA promulgates standards based on SD/FF, Class A and B facilities would have to undertake the additional activities described in Table 17. The cost of the additional work necessary to comply with a stricter federal standard is $23.5 million.

Should the MPCA promulgate acid gas control requirements based on a SD/FF, and EPA does not, no additional costs will be incurred to achieve federal emission limitations. In this case, the cost of compliance with state standards is $20 million greater than the cost of compliance with federal standards.

Table 18. Annual Costs (Thousand Dollars, 1992)

	SD/ESP/Hg	SD/FF/Hg	Activity
NSP Red Wing	4,770	7,048	SO_2, Hg, Monitor
UPA	250	600	SO_2
	1044	1044	Hg, Monitor
NSP Wilmarth	250	600	SO_2
	581	581	Hg, Monitor
HERC	699	699	Hg, Monitor
TOTAL	**7590**	**10,525**	

Table 18 contains the annual costs associated with SD/ESP and SD/FF, which includes the debt service on the capital expenditures. If SD/ESP standards were adopted by the MPCA, and EPA adopted SD/FF standards, the facilities would need to upgrade their facilities, which will increase their annual operating costs by $3 million sometime in the future. If the reverse happens, and the MPCA were to adopt SD/FF and EPA does not, every year after federal adoption of standards, the annual cost of compliance with the state standards will be $3 million greater than the cost to comply with the federal standards.

Because SO_2 reductions are negligible between the application of SD/ESP and SD/FF, and all Minnesota facilities have demonstrated the ability to achieve dioxin emission concentrations equal to that achievable with a SD/FF, there is no environmental benefit to imposing SD/ESP over SD/FF. The MPCA therefore has chosen to promulgate standards of performance for existing Class A and B facilities based on the level of performance demonstrated with the use of SD/ESP. The cost impacts with this choice of technology will not result in unreasonable expenditure of funds, should EPA promulgate requirements to achieve higher SO_2 removal efficiencies. Therefore, SD/ESP technology represents a reasonable level of emissions control for Class A and B facilities.

c. Discussion of Limits

(1) Acid Gas Emission

The proposed acid gas emission limits allow the owner or operator of a waste combustor to demonstrate compliance by either a concentration emission limit or a minimium removal efficiency. As the concentration of a pollutant in the exhaust gas decreases, its removal becomes more difficult. For well-operated facilities from which the uncontrolled acid gas emission are low, it would be extremely difficult to achieve a high removal efficiency. In these casaes, the application of a standard that is described in terms of a concentration is more appropriate. Therefore, the proposed emission limit is combination of either a removal efficiency or a concentration. For most waste combustors, the uncontrolled acid gas emissions are high enough that it is expected that compliance determination will be by removal efficiency.

(2) Particulate Matter Emission Limits

Spray dryers/ESPs are capable of achieving a front-half particulate matter emission limit of 0.015 gr/dscf. A "front-half emission limit of 0.015 gr/dscf is proposed for adoption for Class A and B facilities. The front-half particulate matter has been defined in proposed part 7011.1265 subp. 2. A. (1) as the particulate matter measure by EPA Method 5. A total PM emission limit of 0.020 gr/dscf is proposed for Class A and B waste combustors, and is defined in part

7011.1265 subp. 2.A (2) as the particulate matter concentration measured by Minn. Rules part 7011.0725.

This dual particulate matter emission limit is proposed in order to ensure that standards are equal to those promulgated by EPA, as well as to incorporate into the standards of performance the measurement of PM_{10}. Federal emission guidelines impose PM limits based on what would be measured using Method 5, resulting in the measurement of only a portion of the particulate matter emitted from the waste combustor stack. Method 5 measures the portion of the PM emitted that would be a solid at temperatures up to 320 degrees F (40 CFR Part 60.58a (b)(3) and Appendix A, Method 5). Minn. Rules part 7011.0725 describes the procedures for measuring both the solid material measured with Method 5, as well as the condensable organics emitted from the stack that are liquid at ambient air temperatures ("back half" particulate matter).

Almost all condensable particulate matter (material collected in the "back-half") is PM_{10} (particulate matter with an aerodynamic diameter 10 microns or less). Because particles with a diameter of 10 microns or less can penetrate deeply into the respiratory system, in 1987 the EPA revised the ambient air quality standards from a "total suspended particulate matter" (TSP) standard with a nominal diameter of 25 to 45 microns to a PM_{10} standard. The decision to make this revision is based on the greater health risk from the deeper penetration of the smaller particles. In adopting the revised ambient air quality standards for particulate matter, EPA stated that it would proceed to revise new source performance standards (NSPS) to reflect the change to PM_{10}. The transition from TSP to PM_{10} has not been applied to all federal regulations. When proposing the promulgated emission guidelines for MWCs, EPA did not specifically consider PM_{10} emissions (Exhibit 4). The MPCA has already begun the process of regulating PM_{10} emissions from sources. The proposed rule is a part of that process, and includes a standard for total particulate matter. It is reasonable to adopt a standard that considers "back-half" particulate matter emissions because, eventually, the federal standards will require it.

The "back-half" of the particulate matter capture contributes up to 25 percent of the "total" particulate matter captured using the modified Method 5 test method from well controlled waste combustors (Exhibit 4). The front half PM accounts for 75 percent, meaning that a reasonable total PM emission limit that includes both the front and the back half is 0.020 gr/dscf.

The opacity of the flue gases is an indication of the quantity of visible particulate matter in the gases. In this way, monitoring opacity acts as a surrogate for monitoring particulate matter emissions, for which there currently is no method of continuous monitoring. Opacity monitoring is also used to detect significant failures in the pollution control equipment. The opacity limit is established at a level at which the operator of the unit must take immediate action to correct a problem.

(3) Dioxin Emission Limit

The Class A dioxin (PCDD/PCDF) emission limit, as promulgated in 40 CFR 60, Subpart Ca for this size MWC is 60 ng/dscm, based on the application of SD/ESP. The proposed rule establishes a dioxin emission limit of 30 ng/dscm.

Both Minnesota Class A facilities (HERC and UPA) are equipped with spray dryer and fabric filter air pollution control equipment. Emissions testing at HERC in 1989, 1991 and 1992 have consistently shown total dioxin/furan emissions to be less than 7 ng/dscm (Exhibit 4). Three tests at UPA between 1989 and 1992 measured total PCDD/PCDF emissions ranging from 1.3 to 13.1 ng/dscm (Exhibit 4). Stack tests at both facilities between 1989 and 1992 demonstrate that both are capable of consistently achieving the proposed emission limit of 30 ng/dscm.

The proposed total dioxin/furan emission limit for Class B waste combustors is 30 ng/dscm. The federal guideline's emission limit, as promulgated in 40 CFR 60, Subpart Ca for facilities of this size is 125 ng/dscm. Stack tests at NSP's Wilmarth plant with a spray dryer/fabric filter system in place in 1991 demonstrated that this plant is capable of consistently achieving the proposed emission limit of 30 ng/dscm. During 1991, stack emissions at NSP Red Wing Unit 2 averaged 0.77 ng/dscm with a range of 0.27 - 1.6 ng/dscm. Class B facilities in Minnesota are performing better than the national average and the federal guideline established for these waste combustors.

In EPA's review of SD/ESP air pollution control system performance, it was noted that mass burn facilities equipped with SD/ESPs appeared to achieve dioxin emission concentration levels of 60 ng/dscm (Exhibit 4, p. 27). RDF combustor facilities were capable of achieving lower dioxin emissions, possibly due to the higher concentrations of carbon in the uncontrolled flue gases. The Class A facilities have demonstrated compliance with the 30 ng/dscm emission limit, and the two Class B facilities are RDF facilities, meaning that Class A and B facilities are capable of achieving a dioxin emission limit of 30 ng/dscm.

Adopting an emission standard of 30 ng/dscm will achieve the goal of minimizing dioxin emissions to the environment from these facilities and is reasonable because of the facilities demonstrated ability to meet it.

The existing Class A and B waste combustors can consistently comply with EPA's dioxin limit for new municipal waste combustors of 30 ng/dscm. The MPCA is therefore proposing to adopt the proposed emission limit of 30 ng/dscm for Class A and B waste combustors The facilities are already achieving this emission limitation by a substantial margin.

(4) Carbon Monoxide Emission Limit

The MPCA proposes to adopt the carbon monoxide emission limitations for municipal waste combustors that are contained in the federal guidelines. The CO emission limits are based on the type of technology employed, and reflect CO emissions achieved when the facility is using good combustion practices. The CO emission limits were based on the CO emissions measured from facilities that were considered to employ good combustion practices, therefore they are reasonable CO emission limits to be applied to Class A and B MWCs.

Table 19. Environmental Performance Summary for Class A and B Waste Combustors

Potential Emissions (Appendix 2)

	Baseline Conditions	Proposed Standards
Total PCDD/PCDF		
(ug/dscm)	(130-500)	(30)
Total Grams/yr	1474	137
Reduction from Baseline, g/y		1345
CO Emissions		
(ppm)	(100-400)	(100-200)
Total Tons per year		
Reduction from Baseline, tpy		
PM Emissions		
(gr/dscf)	(0.02 to 0.1)	0.015/0.020
Total tons/yr	397	233
Reduction from Baseline, tpy		164
SO_2 Emissions		
(ppm, dry)	(200)	(70 % or 30 ppmv)
Total Tons/yr	1221	623
Reduction from Baseline, tpy		598
HCl Emissions		
(ppm, dry)	(600, 50)	(90% or 25 ppmv)
Total tons/yr	1156	445
Reduction from Baseline, tpy		711
Mercury Emissions		
(long-term , ug/dscm)	varies	30 for RDF, 60 for Mass burn
Total, lbs/yr	1187	402
Reduction from Baseline, lbs per year.		785

(5) Mercury Emission Limits

The emission limits for acid gases, PM and dioxins for Class A and B facilities have been proposed based on the use of GCP, and SD/ESP for control of air emissions. Scrubbing provides the flue gas cooling and retention time that is necessary for activated carbon to be effective in reducing mercury emissions from a waste combustor's flue gases. The proposed emission limits have been established at levels that are achievable through the use of SD/ESP with activated carbon injection air pollution control equipment.

The achievement of these mercury emission limits may require the use of activated carbon injection. The MPCA prepared cost estimates for the installation and operation of activated carbon injection at Class A and B facilities. The estimates are contained in Exhibit 3, Estimated Cost of Waste Disposal/Incineration and Alternatives. The annual cost of installing and operating activated carbon injection at all four Class A and B facilities is about $2.6 million. (This cost includes debt service on capital costs of installation, operation and maintenance labor, utilities, etc.). These facilities have the capacity to combust about 1 million tons per year, resulting in an increased operating cost of $2.90 per ton of waste capacity for mercury control alone. It is reasonable to adopt the proposed mercury emission limit because it is relatively inexpensive for Class A and B waste combustors to control mercury to the proposed level and the environmental and health impacts of small amounts of mercury are great.

(6) Summary

The emission limits proposed for Class B facilities for PM, acid gases, and dioxins results in lower emissions of pollutants to the environment than the corresponding federal guidelines for these facilities. No federal standards have been proposed for mercury emissions. The emission limits proposed for Class A and B facilities for PM and dioxins in Minnesota have been achieved in practice, and are proposed to be adopted to continue to minimize dioxin and overall metals emissions. The proposed mercury emission limits for RDF facilities has already been achieved in practice in Minnesota when the RDF facility has scrubbing equipment (Exhibit 1, p. 2-18 to 2-20). The proposed mercury emission limit for mass burn waste combustors is achievable with the use of activated carbon injection. The proposed standards are reasonable, because they will ensure that facilities maintain the very low emission levels that have already been achieved in practice, and will not result in an unreasonable expenditure to the waste generators using the system.

8b. Reasonableness of Part 7011.1227--Standards of Performance for Class C Waste Combustors

The MPCA proposes emission limits for Class C waste combustors based on the implementation of good combustion practice (GCP) and very good particulate matter control (ESP). No post-combustion pollution control for acid gases or mercury is taken into consideration in the proposed emission limits. In developing the emission limits for Class C waste combustors, the MPCA evaluated MACT for these units to try to determine what the EPA may propose based on the requirements of the CAA. The MPCA also evaluated the ability of communities to control the flow of waste to solid waste management facilities and the expected cost of various levels of pollution control.

The proposed Class C emission limits are based on these evaluations. The following discussion expounds upon these evaluations (MACT, the expected cost of various control levels, and waste flow control).

On December 21, 1989, EPA proposed emission limitations for existing "small municipal waste combustors." Small MWCs were defined as those waste combustor plants capable of combusting 250 tons per day or less of MSW (54 FR 52298). This proposal was made as part of EPA's entire proposed emission limits for all municipal waste combustors.

The emission guidelines containing air emission limits for the large and very large existing municipal waste combustors were promulgated in February, 1991, as previously described.

EPA did not promulgate the proposed standards for small MWCs, choosing instead to repropose the standards at the same time that MACT-based standards for the large and very large MWCs are proposed. It is not known when EPA will repropose MWC standards for small municipal waste combustors.

EPA's proposed 1989 emission limits for existing small MWCs are presented in Table 20. The emission limits for these facilities are based on EPA's evaluation of the best demonstrated technology for these waste combustors. Best demonstrated technology (BDT) was determined by EPA to be efficient control of particulate matter, combined with good combustion practices.

EPA stated in 1989 that to impose acid gas controls at these small waste combustors would result in an increase nationally of $9 to $44/ton of waste processed. Imposing GCP with efficient PM control (no acid gas control) would result in national increases of negligible costs to $17 per ton of waste processed. For perspective on what these increases mean, in 1989, EPA stated that waste processing costs at those facilities ranged nationally from $36 per ton up to $100 per ton, before imposing the emission guideline requirements. EPA concluded that the increase in waste processing cost as a result of requiring acid gas control is unreasonable (52 FR 52230 December 20, 1989).

a. MACT Floor for Class C Waste Combustors

As discussed previously, EPA must establish standards for small existing municipal waste combustors based on the technology used at the best performing 12 percent of the units in a category. This level of technology is referred to as the "MACT Floor".

For small municipal waste combustors (Class C in this proposed rule), the MACT floor for controlling air emissions will likely reflect good combustion practices and efficient particulate matter control (ESP) because greater than 12 percent of existing small municipal waste combustors in the United States use GCP in combination with ESPs. Because only about 5 percent of small municipal waste combustor units use controls which provide acid gas reduction (including wet scrubbing) it cannot be considered the MACT floor. Thus the "floor" that EPA may use to consider control technologies for these existing combustors does NOT include the use of acid gas controls.

The MPCA believes that it is unlikely that EPA will reverse itself by imposing acid gas control requirements on small MWCs. Nationally, small waste combustors do not produce a significant percentage of emissions from waste combustors. These combustors account for about 10 percent of the total combustion capacity and less than 10 percent of the SO_2 emissions nationwide. Imposing acid gas control requirements on existing waste combustors nationally would result in significant financial outlays without substantial emission reductions (54 FR 52230, Dec. 20, 1989).

Table 20 shows the emission limits that were proposed, but not promulgated by the EPA.

Table 20.
Proposed EPA Emission Guidelines for Small MWCs
All Emissions corrected to 7% O_2

Pollutant	Emission Limitation
Particulate Matter	0.030 gr/dscf
Opacity	10%
Dioxins	
Small (except RDF)	500 ng/dscm
Small RDF	1,000 ng/dscm
	Acid Gases (percent reduction of parts per million by volume, whichever is less stringent)
Sulfur dioxide	none
Hydrogen Chloride	none
Carbon Monoxide (by technology type, not size)	
	Emission Concentration
Mass burn Waterwall	100 ppmv
Mass burn Refractory	100 ppmv
Mass burn Rotary Waterwall	250 ppmv
Modular Starved Air	50 ppmv
Modular excess air	50 ppmv.
Refuse Derived Fuel Stoker	200 ppmv
Bubbling fluidized bed combustors	100 ppmv
Circulating fluidized bed combustor	100 ppmv
Coal/RDF mixed fuel-fired combustor	150 ppmv

b. Selection of the Level of Control for Minnesota Facilities

The MPCA also undertook an evaluation of the impacts of imposing varying levels of air pollution control at the eight Class C waste combustors in Minnesota. This effort encompassed an evaluation of the technologies available to reduce emissions from the waste combustors, the cost of installing and operating each of those alternatives, and the environmental benefits from imposing the alternatives.

Three alternatives for controlling emissions from Class C waste combustors were developed by the MPCA: Option 1, retrofitting PM control equipment to achieve high PM removal; Option 2, dry sorbent injection and fabric filters, with activated carbon injection; Option 3, spray dryer and fabric filter, with activated carbon injection.

Table 21 presents the environmental impacts from the three alternatives, based on the potential emissions from the facilities. (Potential emissions are the maximum emissions a facility could potentially emit, under its physical, operational and permit limitations.) "Baseline" emissions represent emissions from the facilities currently.

Option 1, very efficient particulate matter control, results in the reduction in particulate matter from the facilities. Reduction of particulate matter emissions that requires flue gas cooling and particulate collection will result in reductions in emission of metals, except for mercury. The emission limits of Option 1 reflect the use of good combustion control, which would include routine emissions testing.

Option 2, dry sorbent injection and fabric filters, with activated carbon injection, results in further reductions in total dioxin/furan emissions, sulfur dioxide emissions, hydrogen chloride emissions, and mercury emissions from Option 1. These reductions are possible due to the use of acid gas control. Sulfur dioxides and hydrogen chloride emissions are neutralized, while the use of the neutralizing sorbent encourages removal of chemical precursors of dioxins, and prevents the formation of dioxins as well. Mercury removal is achieved with the use of activated carbon injected with the dry sorbent.

Option 3, spray drying is used in place of dry sorbent injection. With this method of acid gas control, a high level of sulfur dioxide removal is possible, as well as an increased removal of dioxins. Mercury removal is achieved with the use of activated carbon injected into the spray dryer unit.

A fourth option is also available for these facilities: dry sorbent injection in combination with an ESP (DSI/ESP) and is titled "Option 2A". This option has been considered by EPA as a retrofit technology for those facilities that currently have no scrubbing systems in place, because it would allow for the continued use of existing ESPs. Application of DSI/ESP technology will lower dioxin emissions over ESPs. Mercury removal with activated carbon can be used with this control technology.

Table 21.
Environmental Performance Summary for Class C waste Combustors Potential Emissions (Appendix 2)

	Baseline	**Option 1**	**Option 2**	**Option 2A**	**Option 3**
Total PCDD/PCDF					
(ng/dscm)	500	500	125	30	30
Total grams/year	562	562	161	10.5	10.5
Reduction from Baseline, g/y		0	401	552	552
CO Emissions (ppm)	100	100	100	100	100
Total tons/yr					
PM Emissions					
(gr/dscf)	0.08/0.04	0.02	0.02	0.02	0.02
Total Tons/yr	217.6	69.5	69.5	69.5	69.5
Reduction from Baseline, tpy	0	148	148	148	148
SO_2 Emissions					
(ppm, dry)	200	200	80%, or	50%, or	85% or
			35 ppm	35 ppm	35 ppm
Total Tons/yr	626	626	125	336	94
Reduction from Baseline, tpy	0	0	501	336	532
HCl Emissions					
(ppm, dry)	600	600	90%, or	80% or	95% or
			25 ppm	25 ppm	25 ppm
Total Tons/yr	833	833	83	167	42
Reduction from Baseline, tpy	0	0	750	666	791
Mercury Emissions					
(ug/dscm)	600	600	60	60	60
Total, lbs/yr	1610	1610	161	161	161
Reduction from Baseline, lbs/yr	0	0	1449	1449	1449
Hg Actual, 1990	967 lbs				

As shown in Table 21, potential PM emissions from Class C waste combustors would be reduced by 72 percent under all options considered.

MSW incinerator units constructed after 1971 with a processing capacity of 50 tons per day or greater are currently subject to federal regulation 40 CFR Part 60 Subpart E Standards of Performance for Incinerators (60.50 to 60.54). This performance standard imposes a particulate matter emission limit of 0.08 gr/dscf at 12% CO_2 for MSW incinerator units, and an opacity limit. No other pollutants are specifically regulated under this performance standard.

The 1971 performance standard, applicable to the Class C waste combustors, is achievable with the use of efficient particulate matter control devices. Any technology can be used to achieve the standard, however, the most-widely used control device at waste combustors with processing capacities greater than 50 tons per day is an electrostatic precipitator (ESP).

Thus, the evaluation of technologies for retrofitting waste combustors has focused on the ability to continue to use ESPs for particulate matter control. In EPA's review of improving particulate matter capture, resulting in lower PM emission limits, it was concluded that a PM emission limit of 0.030 gr/dscf is achievable by upgrading or rebuilding existing ESPs.

ESPs can achieve PM emission concentrations of less than 0.01 gr/dscf. Those that achieve this level of control are designed to do so, and are considered state-of-the-art for ESPs. Rebuilding existing ESPs that were originally designed to achieve less restrictive PM emission concentration limitations will not result in those ESPs achieving PM emission concentrations of less than 0.030 gr/dscf. Rebuilding an ESP can include replacing worn and damaged internal components (plates, frame, electrodes), upgrading of controls and electronics for more effective energization, and flow modeling to improve flue gas distribution. A rebuild does not include changing plate/electrode geometry or adding plate area.

The need and frequency to rebuild ESPs relates to the amount of corrosion experienced at the waste combustor. Since the facilities do not have acid gas controls, flue gas temperatures need to be maintained to prevent the HCl in the flue gas from condensing on downstream equipment. Dew point temperatures will occur during startup and shutdown. To the

MPCA's knowledge, no Minnesota Class C MWC with an ESP has undertaken extensive ESP rebuilds to date. The achievable PM emissions from a rebuild at these facilities, therefore, has not been demonstrated.

When adding additional plate area, factors that influence ESP performance can be modified, so that ESPs that add plate area, or replace ESPs, can achieve emission concentrations of 0.01 gr/dscf. At ESP's where the PM removal efficiency is greater than 98 percent, metals removal is greater than 95%. At ESPs where the PM removal is less, the metals removal is more variable.

Fabric filters are also available to control PM emissions from waste combustors. These systems are typically used in conjunction with sorbent injection. Fabric filters are capable of achieving a PM emission limit of 0.015 gr/dscf at 7% O_2 (front-half).

EPA proposed a PM standard for the Class C municipal waste combustors of 0.030 gr/dscf, the level achievable by upgrading/rebuilding ESPs. In Minnesota, most of the small municipal waste combustors have air emission permits with PM emission limits of 0.08 gr/dscf at 12% CO_2. The facilities have conducted emissions testing, and some have shown the ability to achieve PM emissions less than 0.08 gr/dscf.

Minnesota's Class C waste combustors contracted with Camp, Dresser, McKee (CDM) consulting engineers, to determine the impacts of a PM emission limit of 0.02 gr/dscf (total, equivalent to a 0.015 gr/dscf front half PM concentration) and a dioxin emission limit of 250 ng/dscm. These pollutant concentrations were being considered by the MPCA as emission limits for existing Class C waste combustors.

Six of the eight Class C waste combustors in Minnesota use ESPs for PM control. Two use wet scrubbing systems. CDM determined that in order for the Class C waste combustors to meet 0.02 gr/dscf (total), four of the facilities that use ESPs would need to evaluated either replacing the existing ESP, or install another ESP in series with the existing ESP to meet lower PM standards

(Ref. 140). Two facilities with ESPs could consistently meet 0.02 gr/dscf (Ref. 141). Table 22 shows the PM emissions that are currently being achieved by each of the eight Class C waste combustors in Minnesota and the expected actions necessary to comply with the proposed PM emission limit.

Table 22. Total PM Emissions from Class C Waste Combustors
Particulate Matter (total)

Facility	APCD	Design (gr/dscf)	Permit (gr/dscf)	Achieved (gr/dscf)	Upgrade, Rebuild ESP?	Replace/ Add to ESP?
Olmsted	ESP	0.03	0.08	0.02	yes	no
Fergus Falls	WS		0.08	0.05	unknown	--
Polk County	ESP		0.04	0.04	no	yes
Pope-Douglas	ESP		0.08	0.05	no	yes
City of RW	ESP		0.08	0.015	no	no
Richards	ESP		0.08	0.035		yes
Quadrant	ESP		0.08	0.042	no	yes
WLSSD	WS		--	0.008	no	no

The CDM study did not indicate whether the same construction activity was needed at each of the facilities to achieve a front-half particulate matter standard of 0.030 gr/dscf.

From examination of design, permitted, and achieved PM concentrations at existing ESPs, the MPCA believes that most of the waste combustors will need to invest in either installing additional ESPs to achieve lower PM concentrations, or will need to replace the ESP entirely. The MPCA believes that since additional equipment appears to be necessary, the equipment installed should be state-of-the-art equipment. Therefore, the MPCA has proposed for all options, a PM limit that reflects the concentrations achieved by highly efficient PM control devices, 0.020 gr/dscf (total) or 0.015 gr/dscf (front-half). This PM concentration can be achieved with an ESP or FF. Some wet scrubbing systems have also achieved this level of PM emission control. The estimated cost to achieve the proposed level of PM control is $8 to $10 per ton of waste processed. This is an increase of approximately a 9 to 15 percent in the estimated cost to process waste at a Class C waste combustor (Exhibit 3 pp. 64). Since improved PM control will be required by federal regulations in the future (and is required by the CAA) and it is demonstrated that a PM emission limit of 0.020 gr/dscf (total) is achievable at a relatively small expense, it is reasonable to propose a PM emission limit of 0.020 gr/dscf (total).

Control of acid gases can be achieved by the use of sorbent injected into the flue gas stream or combustor, or by using wet scrubbing technologies. Dry sorbent injection involves the injection of dry materials (lime or other reactive material) into the flue gas. Spray drying involves injecting a water/lime slurry into the flue gas stream. The sorbent injection technologies are usually followed by an ESP or FF.

Wet scrubbing involves the use of water sprays to control primarily particulate matter, however, acid gas removal occurs due to the use of water for PM removal. The use of wet scrubbing systems at municipal waste combustors nationwide is minimal, although in Minnesota, two of the eight Class C municipal waste combustors use wet scrubbers for PM control. Wet scrubbing is more typically a component used in air emissions control at hazardous waste incinerators.

Although acid gas scrubbing technologies have been developed to control acid gases, additional removal of dioxins and metals is achieved as well. Dry sorbent injection with an ESP will remove metals emissions at levels similar to an ESP alone. Dioxin emissions are lower, however. Testing at a facility where sorbent was injected into a duct prior to the ESP showed a 90 percent removal of dioxins. At several DSI/FF installations, estimated dioxin removals ranged from 79 to 90 percent. Dry sorbent injection/ESPs are capable of achieving dioxin emissions of 125 ng/dscm, which is the emission limit for dioxins considered in Option 2.

Acid gas removals are also available with DSI. SO_2 emissions are controlled to 80 percent, and HCl emissions are controlled by 90 percent with a DSI/FF. When DSI/ESPs are used, SO_2 is controlled by 50 percent, and HCl by 80 percent.

Spray drying is also available for control of acid gas emissions. Option 3 represents the installation of SD/FF at these waste combustors. The highest level of control of acid gases, metals, and dioxins is achieved with this method of acid gas control. Spray drying/FF at existing MWCs are capable of achieving a 360 ng/dscm dioxin limit, 85 percent removal of SO_2, and 95% removal of HCl.

EPA, in its proposed standards for small MWCs, proposed higher dioxin emission limits for RDF-fired waste combustors. MPCA's review of Minnesota's small RDF facility, a fluidized bed combustor at WLSSD, shows that this facility is achieving much lower dioxin emission concentrations than the limit proposed by EPA. The MPCA does not believe it appropriate to establish emission limits significantly above emission levels that equipment has already achieved, and no further consideration of separate dioxin limits for existing RDF plants will be given.

As shown in Table 21, baseline dioxin emission concentrations were assumed to be 500 ng/dscm, resulting in a potential baseline from these combustors of 562 grams per year. Several plants may need to add to or complement their operations to consistently achieve this emission level, because some facilities are operating at or near this dioxin emission concentration. No further dioxin reductions are likely without the use of acid gas controls. Providing DSI (Options 2 and 2A) to these facilities will reduce dioxin emissions by 446 grams. The use of spray drying (Option 3) would reduce overall emissions by 534 grams.

c. Cost of Levels of Control

Table 23 presents the summary of costs statewide to implement each of the upgrade options. Capital, annual and costs per ton of waste processed are presented. The cost per ton for upgrading to Option 1, highly efficient particulate matter control, range at Minnesota's Class C facilities from \$8 to \$10 per ton. Option 2, DSI/FF with activated carbon, results in a waste processing cost increase of \$41 per ton. Option 2A, DSI/ESP with activated carbon, results in a waste processing cost per ton increase of $35 per ton. Option 3, spray drying, results in an increase of $51 dollars per ton of waste processed.

The current waste processing cost at Minnesota's Class C waste combustors currently ranges from $67 to $89 per ton of waste. Thus, imposing Option 1 would result in statewide waste processing costs at Class C waste combustors of $75 to $99 per ton; imposing standards that reflect Option 2 results in waste processing costs of $108 to $130 per ton; Option 2A results in waste processing costs of $102 to $124 per ton; Option 3, $118 to $140 per ton.

These are estimated operating costs, not tipping fees. In order for the MPCA to evaluate the impacts of this rule making, it is assumed that any increases in the cost of waste treatment are passed directly to the user in the tipping fee. The effects of substantial increases in operating costs, and therefore tipping fees, could be more waste leaving the state to be disposed of in facilities with less restrictive construction and operating standards.

Table 23.
Summary of Costs of Upgrade Options
for Minnesota Class C Waste Combustors
(Thousands of 1992 Dollars)

	Option 1	**Option 2**	**Option 2A**	**Option 3**
TOTAL CAPITAL COSTS				
Thousand $	$13,150-$17,523	$37,543	$33,667	$60,640
TOTAL ANNUAL COSTS				
Thousand $	$2,153-$2,802	$9,926	$9,393	$12,039
COST PER TON OF WASTE PROCESSED				
Dollars/ton/yr	$8.00-$10.41	$36.88	$34.91	$44.74

Until recently, Minnesota counties enacted waste designation (waste flow control) ordinances to ensure that the waste facilities they built received enough waste and thus collected sufficient revenues to support the operation of the facility. The ability to designate waste allowed counties to construct waste processing facilities with the assurance that enough waste was available to support the operation of the facility.

In the spring of 1993, the Eighth U.S. Circuit Court of Appeals in Waste Systems Corp. v. County of Martin declared that Minnesota's designation ordinances constitute economic protectionism, and violate the Constitution's interstate commerce clause. This ruling affects outstate processing facilities in Minnesota very strongly, where seven of the eight Class C waste combustors are located. Tipping fees, the price to deliver a ton of waste to a processing facility, are substantially lower in North and South Dakota, Iowa, and Wisconsin (Ref. 142). This is due in part to those states not having landfill construction standards and operating requirements that are as restrictive as Minnesota's.

Without designation, the marketplace for solid waste management becomes a free market, where competitive pricing for waste will dictate where waste is disposed of/treated. For example, Winona County lost 70 percent of its waste to LaCrosse, Wisconsin after the Court of Appeals rescinded the MPCA's issuance of a permit to Winona County to construct a municipal waste combustor[19]. The loss of this waste not only cut into the revenue the county used to pay for waste disposal, but also into its recycling and household hazardous waste programs. Currently, the Office of Waste Management estimates that 60,000 tons per year of MSW goes out of state.

Regardless of the ability to designate waste, if the costs to process waste are not "competitive," haulers have strong incentives to not deliver waste to any type of waste processing facility. As a result of the recent Eight Circuit Court of Appeals decision in Waste Systems Corp. v. County of Martin, solid waste management facilities in Minnesota (landfills, composts, RDF facilities, and waste combustors) are much more subject to price competition from out-of-state facilities that do not have to comply with Minnesota's stringent standards. It is less expensive for

19 Conversation between Mr. Kevin Dixon of Winona County and Ms. Anne Jackson of the MPCA, January 1993.

waste haulers to deliver the waste to out-of-state facilities (typically landfills) and pay the additional transportation costs than to deliver it to a local solid waste management facility.

Waste generated in the metropolitan area must be placed in a lined landfill. Minn. Stat. SS 473.849 (1992). Under the statute, even if the metropolitan area's waste is not landfilled in Minnesota, the landfill where the waste is finally delivered must be lined. Accordingly, the cost to dispose of metropolitan area waste already includes the cost of a lined landfill, and there is less incentive for this waste to be disposed of out of state.

No such restriction exists for non-metropolitan waste, where seven of the eight Class C waste combustors exist. This waste, without designation, goes anywhere. If waste management costs continue to increase in Minnesota, the pressure to dispose of waste in other states will also increase. This waste is likely to not be recycled, composted or incinerated, which in Minnesota are all preferable waste management techniques to landfilling. Disposal of waste outside of Minnesota in less environmentally-protective facilities is contrary to the Office of Waste Management and MPCA policies of managing Minnesota's waste in Minnesota facilities to the most practical extent possible.

Table 24. Average Solid Waste Management Costs In Minnesota
(Ref. 143)

Facility Type	**Cost per Ton, 1991**
MSW Landfill	$48
Industrial Waste Landfill	$11.37 to $48
Demolition Landfill	$11.37
MSW Compost	$69
Incinerator	$63*
Recycling	Not Available

*Average Cost at MWCs

d. Impact of Mercury Standards

At Class C MWCs that currently do not have acid gas controls, the use of carbon injection would be significantly more costly. Flue gas temperatures must be below 300 degrees F in order to use activated carbon to obtain high mercury removal efficiencies. At temperatures below about 350 degrees F, hydrogen chloride in the flue gases begins to condense. This condensation causes significant equipment corrosion, and acid gas controls are then necessary. Application of activated carbon injection at facilities that currently do not have acid gas scrubbing in place is estimated to cost about $35/ton of waste combusted (Exhibit 3, p. 68).

The proposed emission limits for Class C waste combustors are based on the use of good combustion practices, and highly efficient particulate matter standards. A mercury emission limit is proposed which reflects emission limits achievable with waste separation programs.

The result of imposing a mercury limit will have its immediate consequence at the waste combustion facilities. Minn. Stat. § 116.85 requires stack testing for mercury emissions every 90 days at waste combustors with mercury emission limits. The mere existence of a mercury emission limit will reduce emissions, because facility owners need to ensure that they do not exceed short term emission limits. In order to meet the short-term emission limits, mercury waste management programs will need to be implemented. These facilities have not conducted routine mercury testing in the past, and so the actual long-term mercury emissions from the facilities is unknown. Before the MPCA can determine whether further long-term reductions are needed, a good baseline of existing emissions from the individual waste combustors is necessary.

Mercury emissions from waste combustors will decrease as the prevalence of mercury in the waste stream decreases. For those products for which there is currently no available substitute for mercury, like fluorescent lightbulbs, statute requires separate management and disposal. This, in combination with statutory restrictions on the use and disposal of mercury, will cause the decrease in mercury emissions over the long-term .

The MPCA believes the selection of GCP and highly efficient particulate matter, with mercury emission limits for short and long-term emissions, is a reasonable means of controlling emissions from Class C waste combustors, without imposing undue financial expense on the facility users.

8c. Reasonableness of Part 7011.1229--Table 2

The development of standards of performance for new waste combustor units allows for the use of the best-performing air pollution control systems to minimize emissions from waste combustors. Because MWCs have been identified as significant sources of mercury and dioxin emissions, and emissions to the environment need to be reduced, standards of performance for new waste combustors are proposed to minimize the emissions of these pollutants to the highest degree possible.

a. Class I Emission Limits

On February 11, 1991, EPA promulgated emission limits for waste combustor units built after December 20, 1989, whose waste processing capacity is greater than 250 tons per day. These waste combustor units are represented in this proposed rule as Class I waste combustors. The performance standards for Class I are contained in Table 25.

Table 25.
EPA New Source Performance Standards (40 CFR Part 60 Subpart Ea)
All emissions corrected to 7% O_2
Large MWCs

Pollutant	**Emission Limit**
Particulate Matter	.015 gr/dscf
Opacity	10 percent
Dioxins	30 ng/dscm
Acid Gases (percent reduction or parts per million by volume whichever is less stringent)	
Sulfur Dioxide	80 percent removal or 30 ppm
Hydrogen Chloride	95 percent removal or 25 ppm
Carbon Monoxide (by technology type)	
Massburn Waterwall	100 ppmv
Massburn Refractory	100 ppmv
Massburn Rotary Waterwall	250 ppmv
Modular Starved Air	50 ppmv
Modular Excess Air	50 ppmv
Refuse Derived Fuel Stoker	200 ppmv
Bubbling Fluidized Bed Combustor	100 ppmv
Circulating Fluidized Bed Combustor	100 ppmv
Coal/RDF mixed fuel-fired Combustor	150 ppmv
Nitrogen Oxides	180 ppmv

The emission limits in Table 25 represent the emission levels achievable by the application of the best performing air pollution control systems, SD/FF, and was determined by EPA to be the best demonstrated technology. The emission limits are also expected to reflect the application of MACT, maximum available control technology, under additional requirements of CAA Sec 129.

States are required to promulgate standards of performance that are at least as stringent as those promulgated by EPA. The MPCA has reviewed the promulgated federal standards, and concludes that with two exceptions described below, the federal standards of performance for new waste combustor units represent the best technology available in the United States. Therefore, the federal standards are proposed for regulated pollutants with the exceptions of PM and mercury for which more strict limits are proposed.

(1) Particulate Matter Emission Limit

Spray dryers/FFs are capable of consistently achieving a front-half particulate matter emission limit of 0.015 gr/dscf, which is proposed for adoption as the "front-half" PM emission limit for Class I waste combustor units in proposed part 7011.1229. The front-half particulate matter has been defined in proposed part 7011.1265 subp. 2. A. (1) as PM measured by EPA Method 5. A total PM emission limit of 0.020 gr/dscf is proposed for Class I waste combustor units, and is defined in part 7011.1265 subp. 2.A (2) as the particulate matter concentration measured by Minn. Rules part 7011.0725.

This dual particulate matter emission limit is proposed in order to ensure that standards are equal to those promulgated by EPA, as well as to incorporate into the standards of performance the measurement of PM_{10}. Method 5 measures the portion of the PM emitted that would be a solid at temperatures up to 320 degrees F (40 CFR Part 60.58a (b)(3) and Appendix A, Method 5), and is the required test method to demonstrate compliance with federal new source performance standards. Minn. Rules part 7011.0725 describes the procedures for measuring both the solid material measured with Method 5, as well as the condensable organics emitted from the stack that are liquid at ambient air temperatures ("back half" particulate matter). Federal new source performance standards impose PM limits based on what would be measured using Method 5, resulting in the measurement of only a portion of the particulate matter emitted from the waste combustor stack that is potentially PM_{10}.

Almost all condensable particulate matter (material collected in the "back-half") is PM_{10} (particulate matter with an aerodynamic diameter 10 microns or less). Because particles with a diameter of 10 microns or less can penetrate deeply into the respiratory system, in 1987 the EPA revised the ambient air quality standards from a "total suspended particulate matter" (TSP) standard with a nominal diameter of 25 to 45 microns to a PM_{10} standard. The decision to make this revision is based on the greater health risk from the deeper penetration of the smaller particles. In adopting the revised ambient air quality standards for particulate matter, EPA stated that it would proceed to revise new source performance standards (NSPS) to reflect the change to PM_{10}. This transition from TSP to PM_{10} has not been applied to all federal regulations. When proposing the promulgated emission guidelines for MWCs, EPA did not specifically consider PM_{10} emissions (Exhibit-I). The MPCA has already begun the process of regulating PM_{10} emissions from sources. This proposed rule is a part of that process, and therefore includes a standard for total particulate matter.

The opacity of the flue gases is an indication of the quantity of visible particulate matter in the gases. In this way, monitoring opacity acts as a surrogate for monitoring particulate matter emissions, for which there currently is no method of continuous monitoring. Opacity monitoring is also used to detect significant failures in the pollution control equipment. The opacity limit is established at a level at which the operator of the unit must take immediate action to correct a problem.

(2) Mercury Emission Limits

Mercury removal of greater than 85 percent is achievable with the use of SD/FF and activated carbon injection. Because the new source performance standards require the use of highly efficient acid gas scrubbing equipment, activated carbon injection is available for control of mercury emissions. The standards of performance for new units therefore include mercury emission limits, short-term and long-term, as well as a removal efficiency, that reflects the lowest achievable emission limitation for new Class I waste combustor units.

b. Class II Emission Limits

On December 20, 1989, EPA proposed emission limitations for new "small municipal waste combustors". Small MWCs were defined as those waste combustor plants capable of combusting 250 tons per day or less of MSW (54 FR 52298). Emission limits were proposed as part of EPA's entire proposal to establish emission limits for all municipal waste combustors.

The new source performance standards containing air emission limits for large new municipal waste combustor units were promulgated in February 1991. EPA did not promulgate standards for new small MWCs, choosing instead to repropose the standards at the same time that EPA reproposes revised, MACT-based standards for large MWCs to conform with CAA requirements.

EPA's December 20, 1989 proposed emission limits for new small MWCs are presented in Table 26. The emission limits for these facilities are based EPA's evaluation of the best demonstrated technology for these waste combustors. Best demonstrated technology was determined by EPA to be the use of good combustion practices, and the application of dry sorbent injection and electrostatic precipitators (DSI/ESP) or dry sorbent injection and fabric filter (DSI/FF) systems for PM and dioxin emissions control.

Table 26.
Proposed EPA New Source Performance Standards for Small MWCs
All Emissions corrected to 7% O_2

Pollutant	**Emission Limitation**
Particulate Matter	0.015 gr/dscf
Opacity	10%
Dioxins	75 ng/dscm
Acid Gases (percent reduction of parts per million by volume, whichever is less stringent)	
Sulfur dioxide	50 percent or 30 ppmv
Hydrogen Chloride	90 percent or 25 ppmv
Carbon Monoxide (by technology type, not size)	
Technology	Emission Concentration
Massburn Waterwall	100 ppmv
Massburn Refractory	100 ppmv
Massburn Rotary Waterwall	250 ppmv
Modular Starved Air	50 ppmv
Modular excess air	50 ppmv
Refuse Derived Fuel	200 ppmv
Bubbling fluidized bed Combustors	100 ppmv
Circulating fluidized bed Combustor	100 ppmv
Coal/RDF mixed fuel-fired Combustor	150 ppmv

Additional reductions of MWC emissions would be achieved by applying the most stringent control technology, SD/FF, to all MWCs, regardless of size. EPA at that time concluded that further emission reductions were small, and costs unreasonably high for small facilities to install SD/FF. Thus, DSI/ESP or FF technology was selected as BDT for new small MWCs.

The MPCA expects that in Minnesota, new construction of small MWCs is likely to occur at existing waste combustors, rather than the construction of brand new facilities. The MPCA believes that rather than continue to wait for activity to occur at the federal level, in an unknown timeframe, it is necessary to provide direction to small MWC operators as to what levels of air emission control they should expect to achieve in the planning and design of new waste combustor units.

Because of the increasing concern related to mercury emissions in the state of Minnesota, and the necessity of acid gas scrubbing for effective mercury emissions control, the MPCA proposes that emission limits for new construction reflect the use of acid gas scrubbing at these units.

As described earlier, there are several methods available for the control of acid gases from waste combustors. Dry sorbent injection, spray drying and wet scrubbing were evaluated for their overall acid gas, PM, dioxins and mercury control. Dry sorbent injection with a fabric filter and activated carbon injection (DSI/FF/c), or spray drying with a fabric filter with activated carbon (SD/FF/c) offer the highest levels of control of dioxins and metals, including mercury.

The MPCA has estimated the cost of the use of ESPs, DSI/FF/c and SD/FF/c, at small MWCs (Exhibit 3, pp. 50-57). The cost estimates were prepared for a 75 ton per day facility (TPD), and a 200 TPD facility in order to determine the range of cost impacts.

Table 27.
Costs of Small MWC Control Options,
(1992 dollars per ton of waste processed)

	Baseline	**Option 1**	**Option 2**	**Option 3**
75 TPD MWC	$67	$72	$96	$116
200 TPD MWC	$89	$91	$98	$112

Notes: Baseline: Good Combustion Practices, with 94% PM Removal Efficiency ESP
Option 1: GCP, 97% PM Removal Efficiency ESP
Option 2: GCP, DSI/FF/c
Option 3: GCP, SD/FF/c

Under current state and federal rules, small MWCs are required to install highly efficient PM control equipment (although under current environmental review procedures, the MPCA expects that future MWCs would include acid gas scrubbing, even without this rule making). The installation of highly efficient ESPs is expected to result in an annual cost for each ton of waste combusted of $67 to $91 (baseline and option 1).

The imposition of standards that require the use of DSI or SD will result in an increase in the annual costs, and is most severe for the smallest MWC. The annual operating cost of a 75 TPD MWC increases by nearly $30 dollars per ton with DSI (option 2) and by $50 for SD (option 3). The annual operating cost of a 200 TPD MWC increases by about $10 per ton for DSI, and $23 for SD.

The difference in the environmental performance between the two control technologies is the ability to remove acid gases. A SD/FF/c would emit PM emission concentrations (total) of less than 0.020 gr/dscf, dioxin emissions less than 30 ng/dscm, annual mercury emissions of 60 ug/dscm, and would remove 85 percent of the SO_2 emissions and 95 percent of the HCl emissions. A DSI/FF/c would emit similar PM, dioxin and mercury emission concentrations, but would remove only 80 percent of the SO_2 emissions, and 90 percent of the HCl emissions.

Under Section 129 of the Clean Air Act, standards of performance for new waste combustor units must reflect emission concentrations achieved in practice at the best controlled similar unit, as determined by the Administrator. This level is termed MACT for new facilities. EPA has not yet proposed new source performance standards for small MWCs that reflect MACT, although EPA was required to promulgate emission standards for these units by November, 1992 (Clean Air Act, Sec. 129 (a)(1)(C)).

Review of inventories of small MWCs and their air pollution control equipment does not specify what level of acid gas removal is being achieved at new MWCs with DSI or SD as the acid gas control technology (Refs. 144 and 145). The MPCA is unable to determine whether EPA is able to consider DSI/FF as MACT for small facilities.

The MPCA did issue a permit for a proposed Class II MWC in January 1989 to Winona County that incorporated DSI/FF,[20] establishing a higher level of expected performance for new small MWCs in Minnesota. The permit required that the DSI/FF be designed and operated to provide at least 90 percent removal of HCl.

Given that the environmental benefit between DSI and SD is small, the cost to install SD is significant, and that the MPCA has required the use of DSI/FF at new small MWCs, it is reasonable to adopt standards achievable with the use of DSI/FF/c.

Mercury removal of greater than 85 percent is achievable with the use of scrubbing and activated carbon injection. Because the proposed performance standards for Class II waste combustors require the use of highly efficient acid gas scrubbing equipment, the use of activated carbon injection is available. The standards for new units therefore includes mercury emission limits, short-term and long-term, as well as a removal efficiency, that reflects the lowest achievable emission limitation for new Class II waste combustor units. Because mercury contamination is of great concern in Minnesota, it is reasonable to adopt mercury emission limits that achieve the greatest control of mercury emissions from MWCs.

8d. Reasonableness of Part 7011.1231--Table 3

Class D and III waste combustors include a commercially-operated medical waste incinerator, as well as large on-site waste incinerators at industrial, medical, and commercial sites. These waste combustors are not affected by the promulgated federal standards, or proposed state standards for Class A, B or C waste combustors.

Existing Class D waste combustors typically do not have pollution control equipment. The state rules do not incorporate good combustion practice requirements, so it is probable that these waste combustors have high dioxin emissions. Because of this probability, Class D and IV waste combustors together emit more dioxins than the other groups of waste combustors on a gram/ton-of-waste-processed basis, as well as the greatest overall quantity.

a. Description of Affected Facilities

Proposed part 7011.1231 contains emission limits for waste combustor classes III and D. Class D waste combustors are defined as units with a design capacity of 3 million Btu/hr

(MMBtu/hr) and greater, which combust wastes other than mixed MSW or RDF, and in operation on December 20 ,1989. Class III waste combustor unit are those waste combustor units with a design capacity of 3 MMBtu/hr or greater and less than 15 MMBtu/hr which were issued a construction permit after December 20, 1989.

The MPCA estimates that there are about 20 units that are classified as Class D. They are found at industrial and commercial businesses, and at several hospitals. There is one medical waste combustor unit currently permitted that would be classified as Class III. Facilities' exact classification will be determined at the time that their air emission permits are prepared.

Class D and III combustors generally accept unprocessed waste. Nearly all waste combustors in this classification are modular waste combustors. There are several variations of a modular system, depending on what portion of the combustion air is injected into the first chamber (Exhibit 3, pp. 73 to 75).

The exception to the use of modular waste combustors are those facilities that burn RDF. RDF can be combusted in solid fuel-fired boilers. The CAA and state law provides an exemption from regulation as a waste combustor, solid fuel-fired boilers that combust up to 30 percent by weight RDF. This exemption is based on a 24-hour period, under promulgated federal regulations, and is proposed for adoption elsewhere in this rule. One hospital in Minnesota combusts 100 percent densified RDF in its package boiler during the winter months. Because it burns more than 30 percent by weight of RDF during a 24 hour period, this boiler is a waste combustor.

Medical waste combustors combust infectious waste, general medical waste, and pathological waste. With the exception of pathological waste, this waste is highly combustible, generally having a heat content of 10,000 Btu/lb (Exhibit 3, pg. 80). The heat value reflects the amount of plastic contained in medical waste, ranging from 33 to 75 percent by weight, versus municipal waste, which in Minnesota averages about 11 percent by weight (Exhibit 3, p. 80)(Ref. 146). Medical waste combustors have higher uncontrolled emission concentrations of hydrogen chloride (HCl), and generally higher uncontrolled emissions of dioxins and mercury than municipal incinerators.

Table 28. Comparison of Uncontrolled Emissions from Various Existing Waste Combustors

Source Type	**Municipal Waste Combustor** [1,2]	**Medical Waste Combustor** [1,3]	**Industrial Waste Combustor** [1,3]
Hydrogen Chloride, ppm	600 ppm	1,800 ppm	600 ppm
Dioxins, ng/dscm	200 to 1,000	600 to 30,000	5,000
Mercury, ug/dscm	200 to 600	200 to 3,000	600

Notes: 1) Exhibit 1, p. 2-14; 2) Exhibit 3, pp. 14-15: 3) Exhibit 5, pp. 10 to 13.

Wastes combusted by industrial waste combustors are more difficult to define, due to the variety of wastes generated by different manufacturing processes. Overall, industrial wastes that are likely to be combusted can be described as containing wood, cardboard and plastic, and perhaps some waste generated from a specific industrial process (paint filters, end rolls from paper, inks) (Ref. 147), (Exhibit 3, p. 79). Emissions from these sources are likely to vary depending on the waste combusted.

b. Control of Emissions from On-site Waste Combustors

To determine emissions from this group of waste combustors, the MPCA has prepared a review of uncontrolled emissions, and emissions from available control equipment for Class D and Class III waste combustors. These results are described in detail in Exhibit 5, "Technical Workpaper: Control of Emissions from On-Site Waste Combustors". Emission control technologies reviewed include good combustion practices (GCP), wet scrubbing, and fabric filters with scrubbing. Other technologies may be available to achieve similar emission concentrations as those achieved by these three technologies, however, these are the most frequently installed technologies at Class III and D waste combustors.

The review of available control equipment also included an evaluation of the impacts of imposing various levels of air pollution control at Class D and Class III waste combustors. This effort entailed an evaluation of the technologies available to reduce emissions from on-site waste combustors, the cost of installing and operating each of those alternatives, and the environmental benefits under each control option in terms of reductions in the amount of pollutants potentially emitted.

(1) Baseline Emissions from Class D Waste Combustors

Baseline emissions from Class D waste combustors are examined in Exhibit 5, and are summarized in Table 29. This table shows uncontrolled emissions from industrial incinerators in Minnesota, and both controlled and uncontrolled emissions from medical waste combustors that fall into this class. Two Class D medical waste combustor facilities have permits that require the operation of efficient air pollution control equipment, and so the estimated total quantity of emissions from medical waste incinerators includes the use of the control equipment.

Table 29. Estimated Actual Emissions from Class D Waste Combustors, Baseline Conditions (Appendix 2)

Pollutant/ Source Type	**Industrial**	**Medical**
Number of Units	16	4
Particulate Matter		
Baseline (gr/dscf)	0.20	0.20
Total tons/yr:	123	9.42
Total PCDD/PCDF		
Baseline (ng/dscm)	5000	5000
Total g/yr:	1228	45.6
Sulfur Dioxide		
Baseline (ppm)	200	20
Total, tons/yr	143	3.8
Hydrogen Chloride		
Baseline (ppm)	600	1800
Total, tons/yr	235	38
Mercury		
Baseline (ug/dscm)	600	3,000
Total, lbs/yr	318	175

(2) Description of Available Control Technologies

Emissions from waste combustors can be controlled by controlling the feed stream to eliminate metals or acid gas precursors, by modifying the combustion system to minimize the formation of products of incomplete combustion (PICs), and by adding flue gas treatment equipment to neutralize acid gases and remove PM, metals and organics.

(a) Good Combustion Practices (Exhibit 5, pp. 31-36)

Good combustion practices (GCP) includes properly designed and operated combustion and air pollution control equipment, and well-trained operators. GCP is applied in order to minimize the amount of uncombusted materials exiting the waste combustor, and to minimize downstream dioxin formation when waste heat boilers and air pollution control equipment are used.

Good combustion practice has been translated into several design and operating conditions. Design conditions include having sufficient residence time and equipment capable of maintaining high enough combustion temperatures to completely combust waste, thus minimizing uncombusted materials, including dioxins, in waste combustor emissions. Good combustion practice for on-site incinerators includes the use of waste combustors that maintain an operating temperature of 1800 degrees F and a flue gas residence time of one second. At this temperature and residence time, dioxin emissions are minimized (Exhibit 5, p. 30). Further, PM emissions are reduced because less uncombusted products are released from the combustion system.

Additional flue gas residence time can be provided by installing additional incinerator chambers with auxiliary combustion air and fuel. If the existing incinerator is not amenable to retrofitting (due to overall condition or space limitations), a new incinerator would have to be installed.

Continuous monitoring of several operating parameters is a necessary component of GCP because they are strongly correlated with combustion conditions that minimize pollutant emissions. Carbon monoxide (CO) is a product of incomplete combustion (PIC), for which continuous monitors exist. Combustion of CO to its stable form, CO_2, requires significant energy, where the combustion of other organics requires lower amounts of energy, and proceed more quickly. Because of the relationship between CO, organics and the energy necessary for combustion, useful operating information is obtained by monitoring CO emissions. While poor combustion conditions always produces high CO emissions, high CO emissions do not always indicated poor combustion conditions (Ref. 148). Because CO can indicate conditions of poor combustion, and continuous monitors exist for measuring CO, CO emissions are monitored to ensure that GCP is maintained.

Another component of GCP is monitoring the amount of steam produced at a waste combustor facility. A correlation exists between the heat content of the waste burned and the efficiency of the waste combustor in completely combusting wastes and off-gases (Ref. 149). One way of measuring the "heat load" at waste combustors that generate steam is to measure the amount of steam being produced. This is a requirement that is applied at municipal waste combustors.

Steam production is available for monitoring at Class D and Class III waste combustors that recover heat from the combustor.

Temperature monitoring is also a component of GCP. Monitoring of the combustion chamber, and the inlet temperature to the PM control device, if used, ensures that operating conditions are being maintained that will minimize dioxin emissions. Temperature monitoring of the inlet of the particulate matter control device is necessary because there is the potential to form dioxins downstream of the combustor if flue gas temperatures are not controlled.

Operator training is necessary to ensure that conditions that represent proper operating levels for that waste combustor are maintained. Training is necessary to prevent overcharging of wastes, and to ensure that operating temperatures are maintained.

The application of GCP reduces PM emissions by ensuring that materials are completely combusted before exiting the combustor through maintaining proper flue gas residence times and combustion temperatures. Total PM emission concentrations of 0.15 gr/dscf and dioxins emissions of 600 ng/dscm are achievable from waste combustors using GCP (Exhibit 5, pp. 11, 13). Achievable CO emissions are 50 ppm for modular waste combustors, and 275 ppm for boilers combusting RDF (Exhibit 5, p. 13) . No reduction in metal emissions, including mercury, will occur, because no flue gas cooling occurs to force the condensation and collection of emitted metals. Acid gases are not reduced because there is no neutralization.

(b) Wet Scrubbing (Exhibit 5, pp. 36 to 43)

Emissions data from medical waste incinerators equipped with venturi scrubbers in combination with packed bed towers were reviewed to determine performance of wet scrubbing systems. Wet scrubbers at medical waste combustors can achieve a total (both front and back half) PM emission concentration of less than 0.035 gr/dscf. At this PM emission concentration, lead and cadmium removal efficiencies are 40 percent. HCl removal efficiency is at least 95 percent. Wet scrubbing systems achieve dioxin reductions of 70 percent, and in combination with GCP, can achieve a dioxin emission concentration of 200 ng/dscm.

No information about the performance of a wet scrubber at an industrial waste combustor is available. However, the City of Fergus Falls operates a municipal waste combustor with two units, each of which is controlled by a Hydrosonic wet scrubber. The PM emission concentration achieved at one of the waste combustors was 0.055 gr/dscf, with metal removal efficiencies of greater than 80 percent for cadmium, lead, chromium and arsenic. Mercury removal at this facility was greater than 90 percent (Exhibit 4, p. 29). Dioxin emissions from the system were 489 ng/dscm. Because the exit temperature of the boiler was operated within the temperature window at which dioxin formation rates are highest (Exhibit 4, p. 30), but the outlet dioxin emission concentrations are not as high as expected, it is concluded that some dioxin removal occurred.

Emissions data show that mercury removal at medical waste combustors with single-stage wet scrubbers that used alkaline scrubbing solutions was only 10 percent. This suggests that a wet scrubber can be an effective means of mercury removal if the scrubbing liquid is acidic. Mercury, as it leaves the medical waste combustion chamber, is largely in the form of mercuric chloride (Hg_2Cl), which is readily soluble in water. However, if the scrubbing liquid is made alkaline (e.g. by adding lime or caustic), mercury removal is far less. This suggests that the alkaline scrubbing liquid neutralizes sulfur dioxide in the flue gases, forming a sulfite (Ref. 150). Sulfites are reducing agents, and are capable of reducing mercuric chloride to form elemental mercury (Hg), which is virtually insoluble in water. Furthermore, elemental mercury is volatile, causing the mercury to re-enter the flue gases.

This reduction in the mercury removal effectiveness at wet scrubbers may be improved by the addition of chelating agents to the scrubber water. The chelating agent precipitates metals that are present as chlorides from the scrubber water. One chelating agent that is potentially available is 2,4,6 trimercapto-s-triazine sodium salt (TMT). TMT forms a stable water-insoluble complex with heavy metals thus reducing the mercury's ability to re-enter the flue gas stream (Ref. 151).

(c) **Fabric Filters (Exhibit 5, pp. 44 to 53)**

Fabric filters, or baghouses, are available for installation at on-site waste combustors. Fabric filters are highly efficient at controlling fine particles if they are properly operated and maintained. A fabric filter is a collection of bags made of a fabric material (fiberglass, or nylon, for example). The bags hang within a housing. Air passes through the bags where the PM is retained on bag material. The cake that develops on the filter is the primary filtering mechanism, not the fabric material itself. The collected particles are removed from the filter by various cleaning mechanisms.

Fabric filters have been used in conjunction with scrubbing to accomplish pollutant removal. Fabric filters achieve PM emissions of less than 0.02 gr/dscf (total). Fabric filters with packed bed (PB) towers remove 50 percent of arsenic, cadmium and mercury emissions. Lead removal efficiency of a FF/PB was 98 percent.

Injection of a sorbent that is allowed to buildup on the FF will achieve higher metal removal efficiencies than with a FF/PB. DSI/FF achieves metal removal efficiencies of 80 percent for arsenic, 90 percent of chromium, and 98 percent of lead and cadmium emissions. The highest metals control is available with SD/FF. Removal efficiencies greater than 90 percent of arsenic, 96 percent of chromium, and greater than 99 percent of lead and cadmium emissions are achievable with a SD/FF.

Activated carbon injection reduces mercury emissions from medical waste combustors with DSI/FF or SD/FF to result in achievable average mercury emission concentrations of 300 ng/dscm and peak mercury emission concentrations of 500 ng/dscm (Exhibit 1, p. 5-13). Industrial waste incinerators are expected to have mercury concentrations similar to municipal waste combustors, however, the variability in mercury emissions from these sources has not been established. Because of the lack of information on the range of mercury emissions from industrial waste combustors, it is assumed that emissions are similar to medical waste incinerators, with achievable average mercury emissions of 300 ug/dscm, and peak mercury emissions of 500 ug/dscm..

Dioxin emissions from FF systems appear to vary. Dioxin formation across the waste heat recovery boiler and APCD was measured at a FF/PB, and a DSI/FF. In order to achieve low dioxin emissions, activated carbon injection is necessary at DSI/FF systems. With activated carbon injection, the DSI/FF system achieved an outlet concentration of less than 60 ng/dscm. SD/FF achieved a dioxin emission concentration of less than 50 ng/dscm. Activated carbon injection further lowered SD/FF dioxin emissions.

(c) Environmental Impacts

Five options representing the application of GCP, wet scrubbing, FF/PB, DSI/FF/c and SD/FF/c were applied to Class D waste combustors to determine overall reductions of emissions.

Option 1, the application of GCP, results in the reduction of dioxin emissions by 87 percent over existing emissions. Particulate matter is reduced by 25 percent. No reduction of acid gases or metals, including mercury are achieved with this option.

Option 2, the application of GCP and wet scrubbing, provides an additional 55 percent reduction of PM, and metals removal of 40 percent. Reductions of dioxin emissions of 95 percent over baseline are available with this option. Reductions of HCl emissions of at least 90 percent occur with this option. Mercury emissions, can be reduced from these waste combustors by at least 85 percent.

Options 3, 3A, and 4 incorporate the use of FF for control of PM emissions. Option 3 is represents the installation of a FF/PB. Option 3A is the installation of DSI/FF with activated carbon (DSI/FF/c), and Option 4 is the installation of SD/FF with activated carbon (SD/FF/c). Achievable PM emissions of 0.020 gr/dscf (total) results in reductions of PM emissions from Class D waste combustors of 90 percent compared to Baseline. Mercury reductions of greater than 85 percent compared to Baseline are available.

Dioxin emissions with a FF/PB are slightly higher than with a wet scrubber. Efficient dioxin control is not expected with DSI/FF at Class D waste combustors without activated carbon injection. DSI/FF with activated carbon provides a reduction of 98 percent over baseline emissions. SD/FF reduces dioxin emissions by a slightly greater amount.

Table 30. Environmental Impacts of Control Options

Pollutant/ Source Type	**Baseline**	**Option 1**	**Option 2**	**Option 3**	**Option 3A**	**Option 4**
			WS	FF/PB	DSI/FF/c	SD/FF/c
Particulate Matter						
(gr/dscf)	0.20	0.15	0.035	0.015	0.015	0.015
Total tons/yr:						
Industrial Class D	123	92.3	21.5	9.2	9.2	9.2
Medical Class D	9.42	7.1	1.65	0.71	0.71	0.71
Total PCDD/PCDF						
(ng/dscm)	5000	600	200	360	60	30
Total g/yr:						
Industrial Class D	1228	147	49	88	15	8
Medical Class D	45.6	17.5	9	15.9	3	2
Carbon Monoxide						
(ppm)		275/50	275/50	275/50	275/50	275/50
Total Tons/yr:						
Industrial Class D						
Medical Class D						
Sulfur Dioxide						
Industrial (ppm)	200	200	200	200	200	200
Total, tons/yr	143	143	143	143	143	143
Medical (ppm)	20	20	20	20	20	20
Total, tons/yr	4	4	4	4	4	4
Hydrogen Chloride						
Industrial (ppm)	600	600	90% removal	90% removal	90% removal	95% removal
Total, tons/yr	235	235	24	24	24	12
Medical (ppm)	1800	1800	95% removal	95% removal	95% removal	95% removal
Total, tons/yr	38	38	0	0	0	0
Mercury						
Industrial (ug/dscm)	600	600	300	300	300	300
total, lbs/yr	318	318	159	159	159	159
Medical (ug/dscm)	3,000	3,000	300	3,000	300	300
Total, lbs/yr	175	175	46.2	175	46.2	46.2

d. Economic Impacts

The cost to retrofit Class D waste combustors with the various options were prepared by the MPCA (Exhibit 3, Chapter 5 and 6, Exhibit 5, Appendix 2). A part of the economic impact analysis included estimating the current cost of operating Class D waste combustors. This task and the costs included in these estimates are described at length in Exhibit 3.

Industrial Waste Combustors

The MPCA currently estimates that it costs $227 per ton of waste processed to operate a 3 MMBtu/hr industrial waste combustor. It costs an estimated $48 per ton of waste to operate a 15 MMBtu/hr intermittent incinerator (one without continuous ash removal equipment), and $47 dollars per ton of waste to operate a 15 MMBtu/hr continuous waste combustor. If the waste combustor owner were to cease operating the incinerator and use current MSW systems in Minnesota for waste disposal, the costs would range from $113 to $162 per ton of waste generated. These costs are contained in Table 31.

In Table 31, the costs to implement GCP, the installation of additional secondary chamber volume, combustion chamber temperature monitoring and CO emission monitoring at Class D waste combustors are shown. Application of GCP results in an increased waste processing cost of $12 to $452 per ton of waste processed, depending on the size of the waste combustor, and the ability to retrofit existing waste combustors. The lower cost for each waste combustor represents the cost to install additional secondary combustion chambers and monitoring equipment. Some facilities may not be able to be retrofitted, and so the cost to replace the existing incinerator with a new and larger incinerator were determined. This activity is represented by the upper range of each estimate for the application of GCP.

Table 31. Costs to Install APCD at an Industrial Class D Waste Combustor
(Capital and Annual Costs in Thousands 1992 Dollars)

	3 MMBtu/hr	**15 MMBtu/hr, Intermittent**	**15 MMBtu/hr, Continuous**
Tons Waste/Unit/Yr	333	3330	5000
OPTION 1: Good Combustion Practice			
$/Ton of waste processed	$90-$452	$18-$141	$12-$124
OPTION 2: Wet Scrubber/Packed Bed			
$/ton of waste processed	$351	$71	$53
OPTION 3A: DSI/FF/c			
$/ton of waste processed	$654	$114	$61
Existing Incinerator Waste Disposal Cost, per ton of waste	$227	$48	$47
Waste Disposal Cost w/GCP, per ton of waste	$317-$452	$66-$141	$59-$124
Waste Disposal Cost w/WS, per ton of waste	$668-$803	$137-$217	$112-$177
Waste Disposal Cost w/DSI/FF/c, per ton of waste	$971-1106	$180-255	$120-$185
Use MSW system for all waste, per ton of waste	$156-$162	$118 to $131	$113-$123

Installation of wet scrubbers in conjunction with GCP results in an increased waste processing cost of $53 to $351 dollars per ton of waste processed. The overall waste processing cost with the use of GCP with wet scrubbing at Class D waste combustors is $112 to $803 per ton of industrial waste disposed of in the waste combustor.

Installation of DSI/FF/c results in the highest increased waste processing costs overall; from $61 to $654 per ton of waste processed. The total waste disposal costs at these waste combustors with DSI/FF/c is $120 to $1106 per ton of industrial waste disposed.

The impacts to medical waste generators is slightly different. Infectious waste generators cannot use the MSW system for disposal of infectious waste without first decontaminating the waste. In the case of sharps, the waste must always be considered infectious until it is disposed of. Because of these special handling and disposal requirements, the cost to dispose of infectious waste is much higher than to dispose of solid waste.

Table 32 contains the cost expected to be incurred at medical waste generators that generate both infectious and solid waste. Alternative 1, upgrading on-site incinerator, reflects the cost impacts of installing GCP. For nearly all cases, alternatives other than on-site incineration results in lesser annual disposal costs. For generators of very large quantities of medical waste, this is not always the case; incineration costs become comparable with commercial disposal or other methods of on-site infectious waste treatment.

Table 32. Costs Impacts at a Medical Waste Combustor (Class D) (Exhibit 3, p. 98)

Tons of Infectious and Solid Waste	**187**	**449**	**919**
Waste Combustor Size	**3 MMBtu/hr**	**3 MMBtu/hr**	**5 MMBtu/hr**
Upgrade On-site Incinerator (1)	$491-$561	$437	$332-$459
Autoclave and Shred (2)	$730	$511	$423
Commercial Waste Disposal (3)	$460-$560	$357-$481	$247-$297
Total Cost per Year for Least-Cost Alternative	$86,000	$160,000	$227,000

Notes: 1): Upgrade or replace incinerator for infectious and solid waste disposal. 2): Autoclave and shred infectious waste; send treated waste with solid waste to MSW system.
3): Contract for commercial infectious waste disposal; send solid waste to MSW system.

e. Selection of Levels of Control for Class III and Class D Waste Combustors

(1) New Waste Combustors--Class III

Since the environmental burden of dioxins and mercury is high, the MPCA believes that new waste combustors must use combustion systems and control equipment that incorporates efficient control of dioxins and mercury.

New industrial and medical waste combustors of this size range are defined as Class III waste combustors, and standards of performance are applied that reflect emission reductions achieved with the use of DSI/FF/c. A PM, dioxin, mercury, CO and opacity emission limit is included in the standards of performance for Class III waste combustors. The PM emission limit combined with the dioxin emission limit will require the use of flue gas cooling, activated carbon injection, and very efficient PM control. A CO emission limit is proposed to provide a continuously monitored emission that, if complied with, ensures the application of GCP. The opacity of the flue gases is an indication of the quantity of visible particulate matter in the gases. In this way, monitoring opacity acts as a surrogate for monitoring particulate matter emissions, for which there currently is no method of continuous monitoring. Opacity monitoring is also used to detect significant failures in the pollution control equipment. The opacity limit is established at a level at which the operator of the unit must take immediate action to correct a problem.

Mercury emission limits applied to Class III waste combustors include both a short and long term emission concentration, as well as a removal efficiency requirement. The application of these standards (short-term, long-term, and percent removal efficiency) is identical to the method of application of mercury standards to Class A, B, C, I and II waste combustors.

The application of this control technology to new facilities will result in expected waste disposal costs at these facilities of about $120 to $180 per ton of waste processed. Class III waste combustors are likely to be very large on-site or commercial medical or industrial waste combustors. This cost is not an unreasonable waste disposal cost, particularly for medical waste disposal, because alternatives to medical waste disposal are few, and have similar or higher costs.

(2) Existing Waste Combustors--Class D

The increase in MSW costs potentially could encourage the continued use, or increased use, of existing on-site waste combustors. Class D waste combustors have already been identified as potentially very large sources of dioxins and mercury. Because of this group's large potential environmental impacts, the MPCA has chosen to revise the existing standards of performance for these waste combustors at this time.

There is a need to reduce environmental emissions of mercury and dioxins. The emissions of these pollutants are significantly reduced with the application of good combustion practices, flue gas cooling and efficient particulate matter capture. The MPCA therefore proposes to adopt air emission limits that reflect the use of good combustion practices and wet scrubbing at Class D waste combustors. The proposed PM emission limit is 0.035 gr/dscf and 20 percent opacity. The proposed dioxin emission limit is 200 ng/dscm. A CO emission limit of 50 ppm or 275 ppm (depending upon the type of waste combustor) is proposed.

Minn. Stat. 116.07, subd. 6. requires that the MPCA consider the economic impacts of its rules. Minn. Stat. 14.115, subd. 2 requires the MPCA to consider methods of reducing the impacts on small businesses in its rulemaking activities. Most Class D waste combustor owners are expected to be small business owners as defined by Minn. Stat. 14.115. The MPCA has, therefore, considered the economic impact of the proposed limits.

The selection of this emission control system will increase operating costs at these facilities by $65 to $130 per ton of waste processed for the largest waste combustors, and $441 to $576 per ton waste processed for the smallest waste combustors in this group. This increases total waste disposal costs to $112 to $803 per ton of waste combusted for this class. This is an increase of greater than 100 percent in the waste processing costs at all Class D industrial waste combustors and is nearly a 400 percent increase for the smallest waste combustors in this class. For the largest Class D waste combustors, the cost is comparable to costs incurred if a waste combustor owner ceased operating the waste combustor and used the MSW system to dispose of wastes. For the smallest facilities in this group, it is more cost-effective to use the MSW system than to operate the waste combustor, even before this rulemaking.

It is not unreasonable to compare the costs of operating a waste combustor against the cost to put the waste into the MSW management system, because very few businesses in Minnesota have Class D incinerators. The MPCA was able to identify only 20 waste combustor units at about individual 15 industries or businesses. The types of industries using incinerators are varied, meaning there is no one particular type of industry or business relies on waste combustion, other than medical waste generators. Even for medical waste generators, the expected cost increase from complying with these standards is not unreasonable, because alternatives to waste combustion for infectious and pathological waste are few, and have higher or similar costs.

The disposal costs for industries using waste combustors at this point appears to be similar to using the MSW system for disposal of industrial wastes. The MPCA believes that landfilling costs will be increasing in the future, which will be reflected in the overall costs of municipal and industrial solid waste disposal.

Landfilling costs are expected to increase for several reasons. EPA recently promulgated new source performance standards for MSW landfills which requires landfills to collect and treat gases that develop when the solid waste degrades in the landfill. Since some of these MSW landfills accept industrial wastes under approved industrial waste management plans, costs to comply with the landfill gas collection standards may be passed on to industrial waste generators.

More importantly, EPA has required that all landfills meet stringent requirements by October, 1993. Federal regulation 40 CFR Parts 257 and 258 (referred to as "Subtitle D") establish minimum construction, operating and monitoring requirements for currently operating landfills that accept MSW. About two-thirds of Minnesota's landfills are unlined without leachate collection systems. Under Subtitle D requirements, these landfills would have to conduct extensive, very costly groundwater monitoring to ensure that there are no impacts to the ground water.

The MPCA solid waste staff are projecting that many of these unlined landfills currently operating in Minnesota will choose to not meet Subtitle D requirements, and will cease operating, thereby reducing landfill capacity in Minnesota. The loss of landfill capacity increases the competition for landfill space, and raises the cost of landfilling. Since some industries can use the

MSW system for disposal of their wastes, the cost of landfilling industrial wastes will increase, along with the cost of landfilling MSW.

In addition to the federal requirements, during the 1993 Minnesota legislative session, the Legislature considered whether industrial wastes should be managed separately from MSW, due to concerns about MSW waste impacting the behavior of industrial waste in landfills. While the Legislature took no action on this issue, there remains considerable interest in separating industrial wastes from MSW for separate management. Separate management of industrial waste will result in higher disposal costs, as there is only one commercial industrial waste landfill operating in Minnesota.

These issues combined indicate that industrial waste management costs will probably increase, thereby making on-site combustion more attractive to industries. The proposed emission standards ensure that these waste combustors are operated to minimize their emissions.

The PM emission limit in the existing standards of performance for Class D waste combustors ranges from 0.1 gr/dscf at 12% CO_2 for new incinerators with a waste processing rate of 2000 to 3,999 pounds per hour to 0.2 gr/dscf at 12% CO_2 for existing waste combustors processing 200 to 2000 pounds per hour (Minn. Rules parts 7011.1202, subp. 2, 7011.1206, subp. 3). Recall that consistently achievable PM emission concentrations with the application of good combustion practices are 0.15 gr/dscf. This emission limit is lower than baseline emissions from a Class D waste combustor, indicating that existing Class D waste combustors are likely out of compliance with current PM standards. The Class D waste combustors will need to upgrade to meet even existing standards.

Existing waste combustors could apply GCP to their waste combustors to meet existing standards, raising their disposal costs from $47 - $227 per ton of waste to $59 - $452 per ton of waste (Table 31). Given this scenario, smaller industrial waste combustors are expected to cease operation rather than comply with existing rules and use the MSW system, saving money. The proposed rule results in only a slightly higher waste disposal cost compared to the cost of bringing a waste combustor into compliance with the existing emission limit.

A PM emission limit (including an opacity limit), a dioxin emission limit, and a CO emissions limit are proposed for Class D waste combustors. A mercury emission limit is not proposed for Class D waste combustors. Minn. Stat. 116.85 requires that incinerators with mercury emission limits in their permits must conduct mercury emissions testing every 90 days. The MPCA estimates that a properly conducted mercury emissions stack testing will cost between $10,000 and $20,000 per event, depending the location of the waste combustor, the time of the year, and the availability of stack testing crews. This represents a testing cost of $40,000 to $80,000 annually, or $8 to $120 per ton of waste processed annually for testing alone, and is burdensome to Class D waste combustor owners.

Minn. Stat. 14. 115 Subd. 3 states that the agency shall incorporate into the proposed rule any of the methods to reduce the cost of compliance provided by the statute that it finds to be feasible, unless doing so would be contrary to the statutory objective that are the basis of the proposed rulemaking. One of several methods of relief for small businesses provided in Minn. Stat. 14.115, Subd. 2 is to establish of less stringent compliance or reporting requirements for small businesses.

Rather than propose a mercury emission limit on Class D waste combustors, the MPCA proposes to reduce mercury emissions through the implementation of mercury separation plans, which when implemented will be less costly than testing for mercury emissions every 90 days. Mercury in waste is being reduced through statutory requirements to reduce mercury in consumer products, and to prohibit disposal of mercury wastes in solid waste (Appendix 6). Since nearly all mercury in the waste partitions to the flue gases in a waste combustor, reduction in the mercury content of waste will reduce mercury emissions. The MPCA proposes elsewhere in this rulemaking that Class D waste combustors develop plans that identify and separate wastes which contain mercury from the waste stream. This is proposed to ensure that reasonable efforts to remove mercury from the waste stream are undertaken by the waste combustor owner.

Further, mercury emissions from Class D waste combustors will not go unmonitored. Class D waste combustors are required to conduct stack testing for mercury as proposed elsewhere in the rule. This will allow the MPCA to monitor mercury reduction efforts. Periodic mercury emissions testing will help determine whether these facilities will comply with future, and yet unknown, federal mercury emission limits required by the CAA (Clean Air Act, Sec. 129 (a)(1)(D)).

Because the standards of performance are achievable at a cost that is comparable to other waste disposal alternatives, and significant reduction of dioxin and mercury emissions is accomplished, the proposed standards of performance are reasonable.

8e. Reasonableness of Part 7011.1233--Table 4

Minnesota users of Class IV waste combustors can be separated into three groups: retail/commercial/industrial firms, hospital/nursing homes/other medical waste generators, and metal recovery firms. In proposed part 7011.1220, the operation of Class IV waste combustors is prohibited, unless the waste combustor is hospital incinerator, a crematorium, pathological waste combustor or animal carcass incinerator, a forensic science laboratory incinerator or a metal recovery incinerator. In proposed part 7011.1220, crematories, pathological waste combustors and animal carcass incinerators are exempted from proposed parts 7011.1201 to 7011.1285. This part affects hospitals, forensic science lab and metal recovery incinerators.

Existing Class IV waste combustors do not have air pollution control equipment. The state rules applicable to these emission sources do not incorporate good combustion practice requirements, so it is probable that these waste combustors have high dioxins emissions. Given the baseline dioxin emission concentration range of 3,000 to 30,000 ng/dscm, Class IV waste combustors as a group emit more dioxins on a gram/ton-of-waste-processed basis compared to other waste combustor classifications, as well as the greatest overall quantity (Exhibit 5).

a. Description of Affected Facilities

Proposed part 7011.1220 prohibits the operation of all Class IV waste combustors, except for hospital, forensic science laboratory, metal recovery incinerators, crematoria, pathological waste, and animal carcass waste combustors. Crematoria, pathological waste and animal carcass waste combustors are exempt from these standards of performance, and are required to meet the design and operating requirements of proposed part 7011.1215, subpart 2. This proposed emission standard therefore applies to hospital incinerators, forensic science laboratories, and metal recovery incinerators.

The MPCA estimates that this standard will apply to about 20 hospital waste combustors, no more than 1 or 2 forensic science laboratory waste combustor units, and 10 metal recovery incinerator units. Most of the waste combustor units are batch units, meaning that the units are loaded once with waste, and allowed to combust the waste over a period of time. Ash is removed after the unit has cooled. Some hospital incinerators may be intermittently operated, meaning that waste is loaded several times during the combustion period. Ash is removed once the combustion of waste is completed.

b. Control of Emissions from On-Site Medical and Pathological Waste Combustors

Exhibit 5 contains the MPCA's assessment of emissions from on-site waste combustors. This assessment reviewed baseline emissions, and emission controls available with the use of good combustion practices, wet scrubbing, and fabric filters with scrubbing.

The review also included an evaluation of the results of applying the various levels of air pollution control.

(1) Baseline Emissions from Very Small On-Site Waste Combustors

Baseline emissions from Class IV waste combustors are examined in Exhibit 5, and are summarized below in Table 33 .

Table 33. Estimated Actual Emissions from Class IV Waste Combustors, Baseline Conditions

Pollutant/Source Type	Medical	Pathological
Number of Units	25	35
Particulate Matter		
Baseline (gr/dscf)	0.45	0.45
Total tons/yr	3.2	3.4
Total PCDD/PCDF		
Baseline (ng/dscm)	30,000	600
Total g/yr	84	1.2
Sulfur Dioxide		
Baseline (ppm)	20	125
Total, tons/yr	0.24	0.7
Hydrogen Chloride		
Baseline (ppm)	1,800	100
Total, tons/yr	12	0.3
Mercury		
Baseline (ug/dscm)	3,000	60
Total, lb/yr	11.5	56*

*This estimate is for crematoria (Exhibit 1, p. 2-10)

The term "pathological" in the above table includes emissions from crematoria and pathological waste combustors. These waste combustors have very specialized applications. Human crematoria are used for the disposition of human body parts. Pathological incinerators are used at research facilities, veterinary, medical and biology schools for the disposal of pathological waste from both humans and animals. Animal carcass incinerators are also used on farms for disposal of certain animals.

Emissions from pathological waste combustors reflect the type of waste that is combusted. Overall, emission concentrations are very low, because the waste consists of material that is mostly water. Mercury emissions from crematoria result from the decomposition of amalgam fillings in teeth.

On-site medical waste combustors in Minnesota combust primarily infectious waste, including sharps. The waste has a very high heat content, due to its high plastic content. Overall emissions from medical waste incinerators are much higher for HCl and metals. The dioxin emission concentrations used to develop the baseline emissions estimate above (Table 33) was measured by EPA at two small on-site medical waste combustors (Exhibit 5, p. 18-20).

Because the emissions from medical waste combustors and pathological waste combustors are very different, and pathological waste combustor emissions are very low, the pathological waste combustors are regulated differently in this proposed rule from medical waste combustors. As described in the statement of reasonableness for proposed part 7011.1215 Applicability of Standards, pathological, crematoria and animal carcass incinerators are exempt from all requirements of parts 7011.1201 to 7011.1285, and special requirements are imposed instead.

(2) Description of Available Control Technologies

Class D, III and Class IV waste combustors have the same type of air pollution control technologies available to minimize emissions. Since the baseline emissions from existing waste combustors are slightly different that those emissions from Class D and III waste combustors, achievable emission concentrations are also different.

(a) Good Combustion Practice

The application of good combustion practice at waste combustors reduces PM, CO and dioxin emissions. GCP will not reduce metal emissions or acid gases, due to the lack of flue gas cooling and metals condensation and acid gas neutralization.

GCP for Class IV waste combustors consists of proper design, construction and operation and maintenance of the waste combustor to destroy or prevent the formation of the pollutants PM, dioxins, and CO. GCP for these units includes using a waste combustor that provides a minimum secondary chamber flue gas residence time of 1 second at a temperature of 1800 degrees F or greater.

The application of GCP at batch waste combustors can reduce PM emissions to 0.08 gr/dscf, dioxin emissions to 600 ng/dscm, and CO to 50 ppm. These levels are achieved basically by promoting the complete combustion of materials before they exit the combustor.

(b) Wet Scrubbing

Wet scrubbers are capable of reducing PM emissions to concentrations of 0.035 gr/dscf. At this concentration, lead and cadmium removals are 40 percent. HCl removal efficiency is at least 95 percent. Wet scrubbing systems achieve dioxin reductions of 70 percent, and in combination with GCP, can achieve a dioxin emission concentration of 200 ng/dscm. Mercury removal at medical waste combustors with single-stage wet scrubbers were only 10 percent. This efficiency may be improved by adding chelating agents to the scrubber system, to achieve a mercury emission concentration of 300 ug/dscm.

(c) Fabric Filters

Fabric filters are available for installation at small on-site incinerators. Flue gas cooling is necessary in order to protect the bags. Flue gas cooling can be accomplished by a waste heat recovery boiler, or a quench chamber that injects water or air. Sorbent injection will also reduce flue gas temperatures, and will also provide further pollutant removals.

Achievable PM emission limits with the use of fabric filters are 0.02 gr/dscf. The use of DSI/FF with activated carbon injection would allow these waste combustors to achieve an average mercury emission concentration of 300 ug/dscm. Dioxin emissions of 60 ng/dscm are achievable with this system as well. A DSI/FF would remove at least 90 percent of HCl emissions from Class IV waste combustors.

c. Environmental Impact

Option 1, the use of good combustion practices, would reduce PM emissions by greater than 80 percent, to less than 0.6 tons per year of PM from these sources. Total dioxin emissions from medical waste combustors would be reduced by greater than 95 percent, from an estimated 84 grams per year to less than 2 grams per year. No reduction in flue gas concentrations of metals, including mercury, or acid gases is available with this option.

Option 2, the use of DSI/FF/c, would further reduce PM, including the reduction of metals, and reduce total dioxin emissions by greater than 99 percent, down to less than 0.5 grams per year. Mercury emissions would be reduced by greater than 85 percent. Reductions in acid gases are also available, reducing HCl emissions by 90 percent.

d. Economic Impacts

The MPCA estimated the capital and operating costs for the installation of a new 3 MMBtu/hr waste combustor to replace an existing waste combustor (Option 1), and the installation of the same waste combustor with heat recovery and a fabric filter (Exhibit 3 p. 131). These costs are shown in Table 34.

As described in the statement of reasonableness of proposed part 7011.1220 Prohibitions, it is doubtful that waste combustors are operating in compliance with existing rules. Existing rules limit PM concentrations for these combustors to 0.2 gr/dscf to 0.15 gr/dscf. As noted in Table 33, baseline PM concentrations from very small waste combustors is 0.45 gr/dscf. Current PM emissions from Class IV waste combustors are up to three times the existing standard.

Table 34. Capital and Annual Costs for a 3 MMBtu/hr Medical Waste Combustor
(Thousand 1992 Dollars)
(Exhibit 3, p. 131

	OPTION 1	OPTION 2
	GCP	DSI/FF/C
Operating Hours	3000	3000
Tons of Waste Processed, Yr	450	450
Capital Cost	$364	$835
Annual Operating Cost	$196	$322
Disposal Cost, $/Ton of Waste Combusted	$437	$715

In order to meet existing PM emission limits, these waste combustors would probably have to install additional secondary chamber capacity. The MPCA does not expect most of the existing incinerators to be upgradeable, due to their current poor condition, or their inability to withstand the higher operating temperatures necessary to lower overall emissions. It is likely that waste combustors would need to be replaced entirely. Since these units would have to be replaced, new waste combustors can be installed that incorporate GCP design requirements. Therefore, option 1 reflects the installation of a new waste combustor. This option results in an annual disposal cost for each ton waste processed in the waste combustor of $437 per ton.

Option 2, installation of a new waste combustor, heat recovery and fabric filter, results in the annual disposal cost for each ton of waste processed in the waste combustor of $715 dollars per ton.

Installation of wet scrubbers at these facilities would result in similar costs as described at small Class D facilities (Table 31). The installation of wet scrubbing at very small Class D waste combustors resulted in annual waste disposal costs of $668 to $803 per ton, which is in the same range as DSI/FF at Class IV waste combustors.

These costs are dependent, to a large degree, upon the amount of waste processed in the combustor. As more waste is processed, the cost-per-ton decreases. The costs above were developed to represent a 300-bed hospital in Minnesota. Operating an on-site waste combustor with

GCP would result in an annual operating cost at a 49-bed hospital (or a forensic science laboratory) of $1,333 to $2,463 per ton of waste. At a 125-bed hospital, the annual operating cost of an on-site waste combustor with GCP is $491 to $561 per ton of waste.

e. Selection of Level of Control for Class IV Hospital Waste Combustors

Clearly, the cost to continuously achieve either existing or new emission standards at small on-site hospital waste combustors is substantial. This cost was compared to alternative means of waste disposal in order to determine what impacts might result from more strict enforcement of the existing standard, or the revision of those standards.

Table 35. Cost Impacts When Upgrading an On-site Waste Combustor at a Small Hospital

Tons of Infectious and Solid Waste (No. of Beds)	**37.4 (49)**	**187 (125)**	**450 (299)**
Waste Combustor Size	3 MMBtu/hr	3 MMBtu/hr	3 MMBtu/hr
Upgrade On-site Incinerator, Per Ton of Waste	$1,333-$2,463	$491-$561	$437
Autoclave and Shred, Per Ton of Waste	$1,208	$730	$511
Commercial Waste Disposal Per Ton of Waste	$679-$749	$460-$560	$357-$481
Regional Disposal Per Ton of Waste	$878		
Total Cost per Year for the Least Cost Alternative	$25,000	$86,000	$160,000

For very small hospitals, the use of a waste combustor that complies with the proposed standards would result in few or no hospitals using a waste combustor for disposal. All alternatives, including commercial disposal of infectious waste and using the MSW system for disposal of general waste, results in lower annual waste disposal costs over operating a waste combustor that would meet current or proposed standards. For small to mid-sized hospitals, the cost for upgrading on-site incinerators becomes comparable to the cost of using alternative methods of treating infectious waste, both now and in the foreseeable future.

The health care delivery system in Minnesota and nationwide is undergoing substantial change to lower the cost of healthcare. Hospitals are reported by the Minnesota Department of Health to be in distressed economic shape. This distressed condition has been demonstrated by the closure or restructuring of hospitals in both the Twin Cities area and outstate Minnesota.

Infectious waste generators must always have a means of disposal available to them. The number of commercial disposal facilities in Minnesota is small, meaning that there may not be a sufficient number of providers of infectious waste disposal to keep infectious waste disposal costs competitive. Selecting an emissions standard that causes the cost of operating the system to be prohibitive puts these generators in a position of extreme dependence on few commercial infectious waste disposal providers.

The MPCA therefore proposes that emission limits for Class IV hospital and forensic science laboratories reflect the use of good combustion practices (GCP). The application of GCP provides significant reduction of PM and dioxin emissions from these facilities. Mercury-waste separation programs are beneficial in reducing mercury emissions from waste combustors. Mercury waste separation programs are proposed for these facilities elsewhere in this rulemaking. Air emission reductions are available at a cost similar to other methods of waste disposal available for hospitals, and at costs to the waste combustors owner similar to the cost to achieve compliance with current emission limits for these waste combustors. The proposed PM and CO emission limits are therefore reasonable.

f. Selection of Emission Limits for Metal Recovery Incinerators

Class IV waste combustors include incinerators operated to recover precious and semi-precious metals from salvaged scrap and trash. There are ten known metal recovery incinerators currently operated in Minnesota. Metal recovery incinerators could be used to incinerate wire to recover copper, however, the MPCA is unaware of any currently incinerating wire in the state.

Emissions of PM and organics can be very high from these combustors. EPA's publication of uncontrolled emission factors for wire incinerators indicates that total PM emissions are potentially up to 4 gr/dscf (Ref. 152). These waste combustors also can achieve very low emissions. MPCA has stack test data for one metal recovery incinerator in Minnesota showing uncontrolled PM emissions of 0.02 gr/dscf (Ref. 153).

Of the ten known operating metal recovery incinerators, eight of them already use fabric filters or wet scrubbers to control emissions. Toxic emissions from these incinerators will depend on the waste stream. The MPCA does not have sufficient information on toxics from these sources to determine baseline emissions nor removal efficiencies achieved with these control devices. However, since PM control is already employed at 80 percent of the facilities, the MPCA proposes PM emission limits achievable with a wet scrubber, or 0.035 gr/dscf.

This PM emission limit results in an increased operating cost to the uncontrolled facilities of $293 per ton of waste processed for a 0.5 MMBtu/hr incinerator, and $178 per ton of waste processed for a 3 MMBtu/hr incinerator, if the original operating cost for a metal recovery incinerator without post-combustion pollution control is $100 (Exhibit 3, pp. 184-185).

For two of the three businesses that operate metal recovery incinerators, the incinerators are a significant source of income and not merely a method of waste disposal. Since Minnesota statutes require the MPCA to consider small businesses in the process of rulemaking it is reasonable to propose a PM emission standard that reflects good control. To impose greater emissions control would place undue burden on these three firms.

9. Reasonableness of Part 7011.1235--Stack Height and Combustion Chamber Requirements of Class IV Waste Combustors

This part establishes the algorithm for the minimum stack height required at Class IV waste combustors, and imposes minimum design and operating conditions on the combustion chamber of Class IV waste combustors.

a. Subpart 1. Stack Height

A minimum stack height is imposed on Class IV waste combustors in this proposed part. Class IV combustors under this proposed rule are the smallest waste combustors. On an individual basis, these combustors have the smallest mass emissions of pollutants. However, these combustors have short stacks and low exhaust gas flowrates. These two factors of these small waste combustors combine to create localized high ambient air concentrations of emitted pollutants.

Commentors suggested that rather than comply with a stack height specification, the waste combustor operator should be given the choice of conducting modeling to demonstrate that excessive ambient air concentrations will not result from the waste combustor's operation.

The focus on waste combustors is due to the toxic emissions, that result from their operation. The MPCA has developed guidance for industry to use to evaluate potential impacts from the release of air toxics, however, these are only guidelines, not rules. The guidelines are revised frequently and are subject to various interpretations. The air toxic guidelines do not provide guidance about how to evaluate ambient concentrations of mercury and dioxins, two pollutants which this rulemaking has focused upon. The MPCA has begun rulemaking to develop ambient air standards for these pollutants, but the date of final adoption of such standards is unknown at this time.

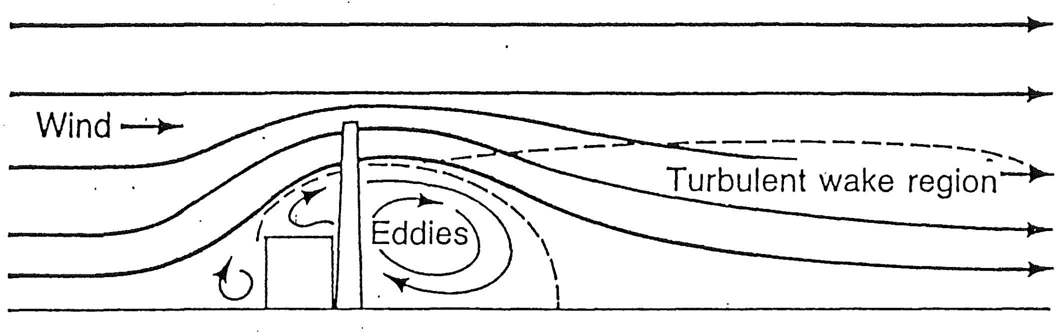
Dispersion modeling is conducted in order to assess whether ambient concentrations of a pollutant have been exceeded. Since no ambient standard for mercury, dioxin and other toxics exist, there is no way of determining whether modeled ambient pollutant concentrations are excessive.

A stack height requirement does not exempt the facility from compliance with the proposed standards of performance for waste combustors. It does help ensure that compliance with those regulations will not be nullified by inadequate stack design.

There are two general methods for reducing the concentrations of pollutants in the atmosphere from a source. Continuous emission controls at the source reduce on a continuous basis the quantity, emission rate or concentration of pollutants released. Alternatively, dispersion techniques rely on the dispersive effects of the atmosphere to carry pollutant emissions away from the source in order to prevent high concentrations of pollutants near the source.

As air moves across a structure, a low-pressure region forms behind the structure. Eddies and wakes are formed in the area. Figure 8 provides a picture of the physical phenomena.

Figure 8
Turbulence Due to Buildings



Source: Air Pollution Control: A Design Approach

Numerous studies have shown that the region of turbulence created by obstacles to windflow extends to a height of about 2.5 times the height of the obstacle (50 FR 27896) (Ref.154). Nearby obstacles also influence the region of turbulence. EPA promulgated stack height consideration regulations that recognize the influence of both the building associated with the stack, as well as nearby buildings. To account for the nearby buildings, the 2.5H formula is revised to that in equation (1), below.

$$\text{stack height} = H + 1.5L \qquad (1)$$

where: H is the height of the building associated with the stack, and
L is the lessor of the height or width of the largest nearby building

"Building downwash" occurs when the stack exit height is within the turbulent wake area. The plume may become entrained in turbulent eddies that tend to move the plume towards the ground, with little or no dispersion or dilution, resulting in high ambient air concentrations, even when the stack gas concentrations meet air emission limitations.

Building downwash decreases when the plume is released higher within the downwash region. Modeling algorithms have been developed by EPA to predict ground level ambient air concentrations when the release height is below the height predicted by H + 1.5L.

Two algorithms are used in current model versions. The more stringent Shulman-Scire algorithm applies when the stack height is below 1.5L. The less stringent Huber-Synder algorithm applies to stacks with heights from 1.5L up to H +1.5L.

The MPCA considered adopting as a minimum stack height the stack height formula of equation (1) for Class IV waste combustors. Comments were solicited from small waste combustor owners, particularly hospitals, on the content of the waste combustor rules. Hospitals that operate Class IV waste combustors pointed out that a four-story hospital (about 60') would need to install a stack that is 150' tall. Guy wires for stacks this tall would be necessary, and in some instances would be located on neighboring property (Refs. 155 and 156). Several rural hospitals, with on-site incinerators maintain helipads to evacuate patients to larger hospitals for further care. One commentor noted that a tall stack would interfere with the use of the helipad (Ref. 157).

While variances from Federal Aeronautics Administration (FAA) requirements can be sought for raising stacks, the MPCA does not believe that such an effort is warranted. Most Class IV waste combustors would be banned under other parts of this proposed rule. Hospital, metal recovery, and animal/human crematoria are the only waste combustors left operating. These waste combustors are intermittently operated, meaning on an annual basis, the total mass of emissions is small. Further, the expense of constructing a tall stack, and pursuing variances represents a significant burden on hospitals that may be already economically distressed.

Ambient air quality impacts at ground level are reduced by increasing the stack height, and a minimum stack height to improve dispersion is still needed. As the commentor remarking about the guy wires pointed out, many of these small hospital incinerators are located close to their neighbors. Raising the stack heights will lessen the frequency of high concentrations of pollutants at the ground level, as well as the concentrations of the pollutants.

Based upon these factors, this proposed part specifies that the minimum stack height from a Class IV waste combustor shall be greater than or equal to that height in equation (2), where H and L have the same meaning as equation (1).

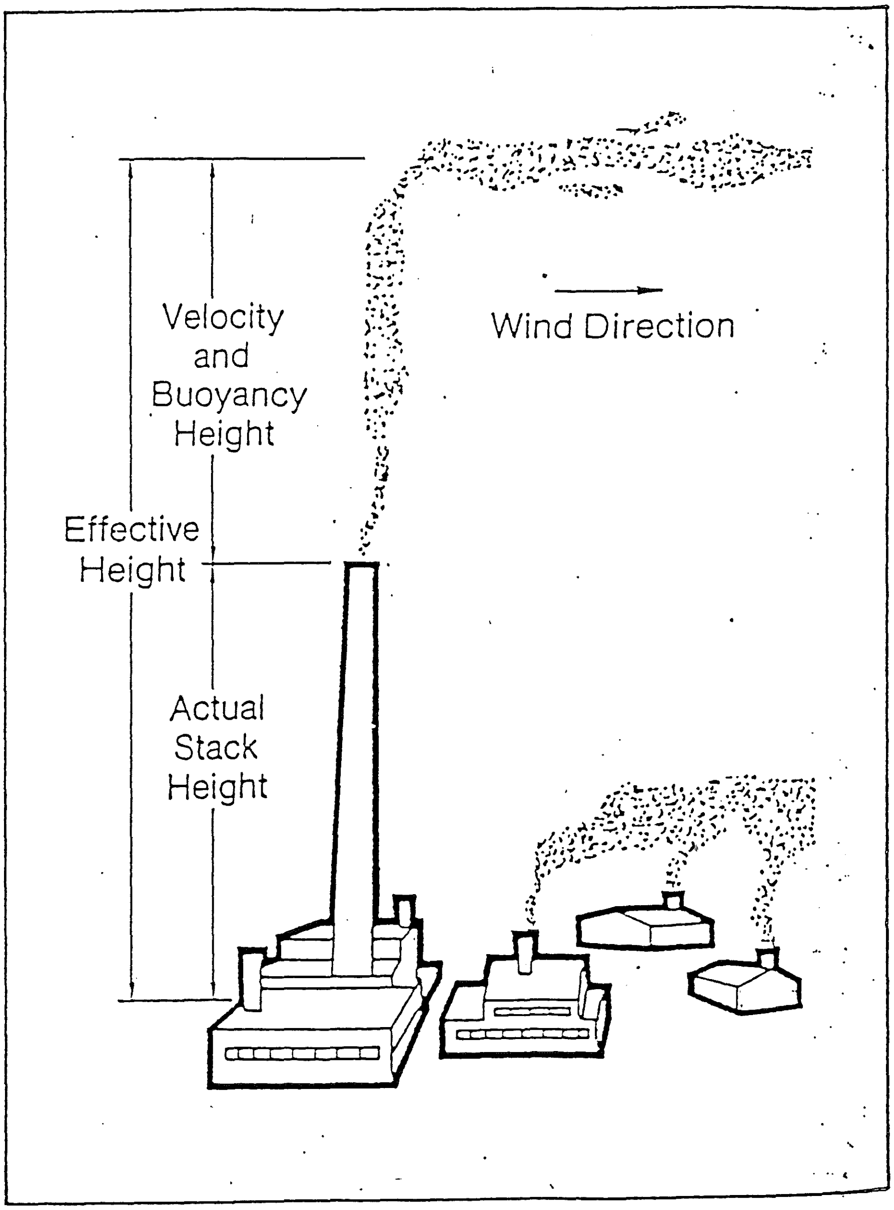
$$\text{Stack height} = H + 0.5L \qquad (2)$$

A stack at this height avoids the most severe building downwash, and will lessen the ground level concentration by an order of magnitude.

Combined with the requirements for good combustion equipment, trained operators and plans for separating mercury from the waste stream, the MPCA believes that exempting a Class IV facility from modeling in favor of using minimum stack heights is a reasonable means of reducing the ambient air impacts from both criteria and non criteria pollutants from Class IV waste combustors.

The MPCA staff considered flue gas conditioning techniques as alternatives to a minimum stack height requirement. Among the techniques considered are flue gas reheating, fan installation, and stack nozzles. These techniques increase the "effective" stack height by either increasing the velocity or buoyancy of the flue gases thereby improving the dispersion of the pollutants emitted. The "effective" stack height is the combination of the physical stack height and the height attained by the flue gases due to the effects of flue gas velocity and buoyancy. See figure 9.(Ref. 158). Application of any of these techniques would have to be evaluated on a case by case basis during the permitting process. A minimum stack height requirement assures reasonable dispersion characteristics from all Class IV waste combustors. Without the minimum stack height requirement, this assurance does not exist. Without the minimum stack height requirement, individual installations would have to be evaluated and individual permitting would be required.

Figure 9
Effective Stack Height



Source: Combustion, Fossil Power Systems

The proposed rule would require an additional 30 ft. of stack height for an incinerator operated in a four story (60 ft.) building. The 30 ft. extension is based on the assumption that the existing stack exits at the building's roof line and the existing foundation can support the additional weight. At the quoted price for stack extensions of $750/ four ft. of stack, it would cost approximately $6,000 to comply with the proposed minimum stack height.[21] At a cost of $6,000, the cost of the additional stack height is approximately 2 percent of the capital cost to install a new 3 MMBtu/hr waste that would comply with the proposed rules (Exhibit 3, page 125). For a more typical one story building, the cost would be approximately $2,000. If circumstances at a particular location would not allow the stack to be extended to the required height, a variance could be sought under Minnesota Rules part 7000.0700 and a permit issued for that particular installation. It would be unreasonable to impose the additional expense and burden of permitting on all Class IV waste combustor owners and operators when the option of a variance is available for the minority of installations where the minimum stack height is unduly burdensome or not possible.

For these reasons, it is reasonable to propose in the rule a minimum stack height instead of other techniques to increase the "effective" stack height.

b. Subpart 2. Combustion Chamber

This subpart requires the final combustion chamber of a Class IV waste combustor to be designed and operated to maintain combustion gases at a minimum of 1,800 degrees Fahrenheit for one second in a zone after the last overfire air or secondary air has entered the combustion chamber.

Combustion conditions impact the quantity of pollutants emitted from a waste combustor, and design conditions directly influence the ability to minimize emissions.

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21 Conversation between Mr. Steve Zeleny MultiService, Inc. and Ms. Anne Jackson of the MPCA on July 8, 1992.

Complete combustion of combustible material requires adequate temperatures, the proper quantities of air, turbulence of the combustion gases, along with sufficient residence time in the high temperature zones of the incinerator to allow the mixing of the gases to occur. The combination of temperature, residence time, and turbulence must be addressed during the design of a waste combustor, and operating conditions to maximize residence time and temperature must be specified by the designer.

The operator of a waste combustor has control over air input rates and operating temperature. Turbulence in the combustion chamber must be addressed during design, as there are few operational parameters that can be adjusted to increase turbulence.

Retention time and operating temperatures are often evaluated in order to determine these parameters' values in minimizing air emissions, particularly products of incomplete combustion (PICs). For reduction of dioxins and carbon monoxide, minimum retention times of 1 second are necessary.

Therefore, it is reasonable to require a minimum combustion chamber temperature and flue gas residence time.

10. Reasonableness of Part 7011.1240--Operating Requirements

The following addresses the reasonableness of the operating requirements as established in the proposed rule. Certain operating requirements proposed in the rule are part of the promulgated federal regulations for municipal waste combustors (40 CFR 60.56a). Therefore, in order to be as protective as the federal regulation, it is necessary to include operating requirements in the proposed state rule. In the following discussion where federal regulations are cited, the citation generally applies only to waste combustor Classes I, A, and B. These are the classes for which federal regulations have been promulgated to date.

In the proposed rule, many of the federal requirements have simply been extended to include some or all of the remaining classifications (II, III, IV, C, and D). In most cases, it is expected that the requirements will be applied to other classifications at the federal level when standards are adopted for those classes. The following includes a discussion of the reasonableness of this extension.

Modern waste combustors are complicated facilities and persons operating these facilities require special skills. The proposed emission limits have been established at a level that is consistent with the implementation of good combustion practice. Specific procedures must be adhered to in order to achieve the emission limits. These considerations indicate the need for proper operation of waste combustors to ensure minimum generation of air pollutants. Therefore, it is reasonable to include operating requirements in the proposed rule.

a. **Subpart 1.** This subpart requires the presence of a certified operator at all times when waste is being combusted. This is an adoption of the same federal requirement for waste combustor Classes I, A and B (40 CFR 60.56a(e)) and an extension of this requirement to smaller combustors.

Good combustion practice (GCP) is an operating method designed to minimize dioxin emissions from municipal waste combustors. The principals of GCP apply equally well to all classes of waste combustors. The proposed emission limits have been established based on the implementation of GCP. Operator training in GCP and certification of the operator's competence in the implementation of GCP (as well as other factors relating to the operation of a waste combustor) is required by the proposed rule (parts 7011.1275 and 7011.1280) and the promulgated federal regulations (40 CFR 60.56a(d) and 60.56a(h)). A significant portion of GCP is the proper operation and maintenance of the waste combustor and air pollution control equipment. Improper operation and poor maintenance due to untrained personnel are problems at all sizes of waste combustors including large municipal waste combustors and small medical waste combustors (Refs. 159 and 160).

Since waste combustors are complicated facilities, the implementation of good combustion practice is necessary to a facility's ability to comply with the proposed emission limits, and not all persons are qualified to operate a waste combustor, it is reasonable to require that a certified operator is present while waste is being combusted.

b. **Subpart 2.** This subpart requires that the inlet temperature to the most efficient PM control device is maintained at a temperature no greater than 30 degrees Fahrenheit greater than the average temperature recorded at that location during compliance testing for which compliance with the dioxin emission limit was demonstrated. This is also a requirement of the federal regulations (40 CFR 60.56a(c)) and an extension of this requirement to smaller combustors.

It has been found that particulate matter control devices (ESPs in particular) often are operated in the temperature range at which dioxin formation is promoted. This temperature range is 392 to 750 degrees Fahrenheit (Exhibit 4 pp. 9-12)(Ref. 161). In order to minimize the likelihood of dioxin formation in the PM control device it was considered reasonable to establish a maximum operating temperature. A maximum operating temperature of 450 degrees Fahrenheit was proposed by EPA (56 FR 5501, February 11, 1991). However, this did not guarantee that a facility that was in compliance with the temperature requirement would also be in compliance with the dioxin emission limit. Therefore, EPA dropped this proposal. In reconsidering this problem, EPA began with the PM control device inlet gas temperature measured during the most recent test during which compliance with the dioxin emission limit was demonstrated. US EPA then conducted a study of the inlet gases temperature range that could be expected during normal operation. It was determined that an allowance of 30 degrees Fahrenheit would provide sufficient flexibility for normal operation. Operators are allowed this flexibility in the operation of waste combustors and the likelihood of continuous compliance with the dioxin emission limit is increased.(Ref. 162). For these reasons, it is reasonable to establish an inlet gas temperature requirement for the particulate matter control device and to allow for normal variation in that temperature (30 degrees F).

c. **Subpart 3.** This subpart proposes the requirement that no waste shall be charged into the waste combustor during start-up from a cold furnace condition. Auxiliary fuels shall be used to achieve combustion chamber operating temperature. This requirement does not prohibit the practice of putting waste on the grates during start-up to protect the grates from the high temperatures. The waste is not burning and acts as a insulating layer for the grates. This is a recommended practice of at least one waste combustor manufacturer (Ref. 163).

Unstable combustion conditions experienced during start-up promotes the formation of products of incomplete combustion (PICs) such as CO. If waste is burned during this period, the emissions of PICs including CO are higher than normal operation. Under typical operating conditions, once the operating temperature is achieved, waste is continuously fed into the combustion chamber at a rate less than the full-load feed rate. As the heat content of the gases from the waste increases, the waste feed rate increases until full load is achieved. At this point the auxiliary fuel is discontinued (Ref. 164).

To minimize the emissions during start-up, it is reasonable to require waste combustors to start from a cold furnace condition on auxiliary fuels.

d. **Subpart 4.** This subpart proposes the requirement that auxiliary fuel shall be used to maintain the combustion chamber operating temperature from the time that the waste feed has been discontinued until the combustion chamber is clear of combustible material. During shutdown, the combustion chamber temperature drops resulting in unstable combustion conditions and higher than normal emissions of PICs (Ref. 165). Therefore, it is reasonable to require the use of auxiliary fuel to maintain the combustion chamber temperature until the waste in the combustion chamber has been completely combusted.

e. **Subpart 5.** This subpart proposes the requirement that no waste combustor shall be operated in excess of 110 percent of the maximum demonstrated capacity. This is an adoption of the federal regulation set forth in 40 CFR 60.56a(b) for municipal waste combustors, and an extension of this requirement to smaller combustors.

To minimize dioxin emissions, two important mechanisms need to be addressed: maximum destruction of organics in the combustion chamber and minimum formation of organics downstream of the combustion chamber. Waste combustor load affects both of these mechanisms.

One factor in the destruction of organics in the combustion chamber is the residence time of the flue gases at a temperature sufficient destroy them. If the flue gas flow rate is excessive, the residence time of the gases at a temperature sufficient to ensure destruction is too short.

Another factor in the minimization of dioxin formation down stream of the combustion chamber is the minimization of the particulate matter entrained in the flue gases. Since particles in the flue gases act as sites for the formation of the organics, organic formation can be minimized by minimizing the number of particles in the flue gases. Therefore, it is desirable to minimize the entrainment of particulate matter in the flue gases (particulate matter carryover) (Ref. 166). Waste combustor heat load affects particulate matter carryover in that excessive heat load increases particulate matter carryover and the flue gas flow rate. Both of these mechanisms (particulate matter carryover and flue gas flow rate), affect organic emissions.

The objective of measuring and regulating the operating load is to ensure that a waste combustor is operated within the envelope in which it demonstrated, during stack testing, that it was in compliance with the dioxin/furan emission limits. Many waste combustors recover the heat produced by burning the waste heating water to the vapor state (steam). The amount of steam produced (steam load) is the direct result of the quantity of waste combusted and the heat content of that waste. Since waste streams can contain many different wastes with many different heat values, the amount of steam produced fluctuates with the content of the waste stream. Due to this variability, in order to continuously comply with a maximum steam load requirement, a waste combustor would have to be operated at less than full capacity. The maximum load level and the time period over which the load level measurements are averaged were established to allow for the variability in the waste stream. Without this flexibility, waste combustors would frequently exceed the operational limit The EPA and the MPCA believe that it is reasonable to allow the load to fluctuate by ten percent to a maximum of 110 percent of the average load under which the waste combustor demonstrated compliance with the dioxin emission limit (Ref. 167).

Since dioxin emissions are closely related to the operating load, it is reasonable to regulate the load under which waste combustors are operated. To allow for fluctuation in the fuel and combustion conditions and to maintain consistency with federal regulations, it is reasonable to allow the flexibility necessary to operate at capacity.

f. **Subpart 6.** This subpart requires the feedrate of additives used to demonstrate compliance with the mercury emission limit during compliance testing to be maintained during normal operation of the waste combstor. It is reasonable to require a waste combustor to be operated in the same manner in that it was during testing in which compliance was demonstrated.

g. **Subpart 7.** This subpart regulates the use of a waste combustor's dumpstack. A dumpstack is defined as any opening functionally equivalent to a chimney, stack or vent by which uncontrolled emissions are vented to the ambient air. A dumpstack on a waste combustor is typically located immediately after the combustion chamber and before the waste heat recovery units and pollution control equipment. When the dumpstack is in use, the combustion gases are vented directly to the atmosphere without passing through the air pollution control equipment. For this reason, it is reasonable to regulate the use of dumpstacks.

Concern about the environmental effects of emissions from waste combustors is one of long-term impacts, not catastrophic events. Therefore, it is reasonable to allow the use of dumpstacks in the event of an emergency. Dumpstack use is not permitted for routine inspection or maintenance without the commissioner's prior approval.

This subpart also specifies the recording requirements (as established in part 7011.1285) for instances in which the dumpstack was used. See the discussion of the reasonableness of the recording requirements in the SONAR for Part 7011.1285. If these items are recorded for each instance of dumpstack use, it is possible to verify whether the use was appropriate.

h. Subpart 8. This subpart reminds an owner or operator of the requirements set forth in Minnesota Rules, Part 7019.1000 which requires notification of the commissioner in the event shutdown or breakdown of equipment that would cause an increase in the emission of air contaminants. This subpart also reminds an owner or operator of the requirements set forth in Minnesota Statutes, section 116.85 which establishes monitoring requirements and the required procedures to be followed in the event of an exceedance of an emission limit. It is reasonable to include these references in the rule that lists all operating requirements.

i. Subpart 9. This subpart requires the owner or operator to notify the commissioner at least ten days in advance of the initial start-up date. This provides the MPCA sufficient time to prepare internally to respond to public comments and concerns that may result from the initial start-up of a large or controversial facility. Because the permit conditions apply within 180 days (at most) of start-up, the MPCA must be notified of the start-up date in order to know, with certainty, when the permit conditions are enforceable.

11. Reasonableness of Part 7011.1245--General Waste Combustor Facility Solid Waste Management Requirements

Solid waste management facilities are subject to Minnesota rules Part 7035. This part specifies which solid waste management, storage and facility are rules of part 7035 apply to waste combustors.

The solid waste rules contain general technical design, construction and operation requirements that apply to all solid waste management facilities. Minn. Rules Part 7035.2525. Specific technical standards exist for mixed MSW landfills (part 7035.2815), demolition debris (part 7035.2825), compost facilities (part 7035.2835), recycling facilities (part 7035.2845), solid waste storage facilities (part 7035.2855), solid waste transfer facilities (part 7035.2865), and refuse derived fuel processing facilities (part 7035.2875). These requirements were developed in order to minimize human and environmental hazards when handling and storing solid waste.

MPCA permit rules part 7001.3050, subp. 3.E. exempts energy recovery facilities from obtaining a solid waste facility permit, except for those facilities producing refuse derived fuel. An energy recovery facility is defined in Minn. Rules pt. 7035.0300, subp. 35 as a site used to capture the heat value of solid waste for conversion to steam, electricity, or immediate heat by direct combustion or by first converting it into an intermediate fuel product. Waste combustors that recover heat are energy recovery facilities under this definition. Minn. Rules part 7001.3050 subp. 4B. terminates the subp. 3E. exemption if other activities at the site necessitate obtaining a solid waste permit.

Operators of waste combustors separate and store wastes that are unfit for combustion, and bypass waste when not operating or operating at capacity. At various times, therefore, a waste combustor may provide the services of a solid waste storage facility, a recycling center, and/or a transfer station. When functioning like a storage facility, recycling center, or transfer station, the waste combustor facility must comlpy with other applicable regulations.

This part is therefore proposed in order to ensure that appropriate solid waste facility technical and operating requirements are imposed and complied with at waste combustion facilities. Review of general solid waste technical requirements shows that not all requirements should apply to waste combustors. Clearly, requirements specifically designed to apply to landfill operations do not apply to waste combustors. Incorporating a general statement in the proposed rule stating that a waste combustor should apply with all applicable parts of Part 7035 would not clearly indicate what "applicable" means. It is reasonable to propose a rule that will specify which solid waste facility standards apply.

Item A. Security requirements. Part 7035.2535, subp 3. establishes the requirements for securing a solid waste management facility from unauthorized entry. The facility owner or operator is required to use a fence or similar device to prevent unauthorized entry onto the grounds of the waste combustor. This part was adopted to ensure that vandalism of the facility does not occur, as well as to prevent injury. Waste combustors are operated at high temperatures, and have numerous worker safety requirements, therefore, it is reasonable to extend to waste combustors security requirements currently applicable to all other solid waste management facilities.

Item B. General inspection requirements. Part 7035.2535, subp. 4 addresses the inspection requirements, considered to be a minimum, applicable to all waste management facility owners and operators. A regular inspection program by the owner or operator is essential to maintaining the integrity of the facility design and operation. Because maintenance of the waste combustor is an integral part of good combustion practice and inspection is an integral part of maintenance, regular inspection of the waste combustor is necessary to comply with performance standards.

Item C. Household hazardous waste management requirements. Part 7035.2536, subp 6 was adopted by the MPCA in response to Minn. Stat. 116.07, which required the MPCA to "adopt rules to require the owner or operator of a solid waste disposal facility or resource recovery facility to submit a management plan for the separation of household hazardous waste from solid waste prior to disposal or processing and for the proper disposal of the waste." This subpart was proposed in 1990 and adopted in 1992. The legislation is quite clear that this requirement would apply to waste combustors permitted by the MPCA. Item C is proposed in order to ensure that waste combustors comply with the statute, and that all solid waste management facilities provide for the proper collection and disposal of household hazardous waste.

Item D. Emergency preparedness and prevention plans and emergency procedures. Part 7035.2595 sets out the program the facility operators and owners must undertake to adequately respond to emergencies at the facility. The program requires design, construction, maintenance and operation of the facility to minimize the possibility of a fire, explosion or release to the air, land, or water of pollutants that would threaten human health or the environment. The part recognizes that it is impossible to identify in rule all the various provisions to minimize the possibility of a fire, explosion or release, and so is written to provide general performance standards, allowing for facility-specific designs.

Part 7035.2605 sets out the minimum procedures to be followed by solid waste management facility owners and operators in preparing for and dealing with emergencies.

These two requirements apply to all solid waste management facilities. It is reasonable to confirm their applicability to waste combustion facilities as well.

Item E. Contingency action plans. Part 7035.2615 requires that the solid waste management facility owner or operator prepare and maintain a contingency action plan at the facility. The plan must identify occurrences that would endanger human health and the environment and must establish procedures that would minimize those hazards. The plan enables the facility owner or operator to plan proactively, rather than to simply react at the time of a facility failure or release. The intent of the plan is to provide a reasoned response to a release or an injurious situation.

Proper waste combustion relies on the maintenance of well designed and constructed equipment. This equipment is subject to the wear and tear of normal operation, as well as sudden, unavoidable failures, such as tube failure in waterwall waste combustors, or the presence of explosive materials in the waste pit. The preparation of a contingency action plan according to the provisions of this part will provide the owner or operator with readily available procedures for both planned and unplanned shutdown of the facility.

Item F. Closure plans and closure procedures. Part 7035.2625 sets out the minimum requirements for the development of a closure plan by facility owners and operators and the times when a facility must be closed. The purpose of this part is so that solid waste management facilities, when at the end of their useful life, are closed, and that planning in advance of closure takes place. This planning must ensure that once the facility ceases operation, human health and the environment are protected.

Part 7035.2635 specifies the procedures a facility must take to close the solid waste management facility.

Item G. Solid waste transfer facility requirements. Part 7035.2865 contains the technical and operating requirements for a solid waste transfer facility.

Transfer facilities are most often used as collection points of solid waste for delivery to either a processing facility or a disposal facility. Normal transfer facility operations result in the delivery of solid waste to MPCA-permitted facilities. According to the solid waste SONAR for 7035.2865, transfer stations are usually small and present a low potential for environmental impacts.

It is reasonable to apply the technical and operating standards for transfer stations to waste combustors, because a transfer station's operations are very similar to a waste combustor's operations. At a transfer station, waste is delivered by a few or many waste haulers, and crudely sorted to remove wastes intended for other management techniques. Many waste combustors accept waste directly from the hauler or operator. The waste is inspected, and what is not combusted is stored for further processing or disposal elsewhere. Because this aspect of waste combustor operations are like that of a transfer station, it is reasonable to regulate the activity under the transfer station rules.

If waste is processed on site to produce refuse derived fuel, then a solid waste permit is required under Minn. Rules part 7001.03050, subp 2, Item F. The technical standards for refuse derived fuel processing would then apply to the facility (part 7035.2875).

Item H. Infectious waste management plans. Minn. rules Parts 7035.9100 to 7035.9150 apply to facilities which accept and treat infectious wastes. Many waste combustors are specifically designed to accept and treat infectious wastes. This proposed rule reminds the waste combustor owner that accepts infectious waste of the duty to prepare an infectious waste management plan for that waste combustor.

12. Reasonableness of Part 7011.1250--Industrial Waste Management Plan

The following addresses the reasonableness of the proposed industrial waste management plan requirement. Part 7011.1250 requires the permit applicant to submit an industrial waste management plan as a part of the permit application. This plan must identify the types of industrial solid waste to be accepted at the waste combustor. An industrial waste management program has been established for all solid waste management facilities under Minn. Rules part 7035.2535 (solid waste rule). As presented in the discussion of the reasonableness of part 7011.1245, solid waste management provisions of the solid waste rules are inconsistently applied at waste combustors due to the waste combustors permit-by-rule status in the solid waste rules. This part is proposed to ensure consistent application of the requirements for an industrial waste management plan at waste combustors.

MSW combustors are a part of a solid waste program that under current solid waste rules must prepare an industrial waste management plan. This requirement may not be clear to all owners and operators of municipal waste combustors, therefore, it is made clear by requiring a plan as a part of an application.

A key component of the plan is the portion of the plan devoted to developing criteria used by the waste combustor operator to determine whether the waste can be accepted at the waste combustor facility. This subpart is proposed for two reasons:

(1) Currently, the industrial waste management system included in a waste combustor's permit is cumbersome and time-consuming for the MPCA and the waste combustor operator.

(2) To many waste combustor owners and operators, MPCA approval of a waste apparently represents a guarantee of delivery of approved waste.

Existing operating permits for MSW combustors state that only MSW can be accepted without special approval by the MPCA. In order for the nonhazardous, non-MSWs to be disposed of at a municipal waste combustor, the waste generator submits to the owner or operator of the waste combustor Toxic Characteristics Leachate Procedure (leaching) results and Material Safety Data Sheets for the waste. The owner or operator then can refuse the waste or apply for approval or a permit amendment to allow the facility to accept the waste. If the owner or operator decides to accept the waste, the information is forwarded to the MPCA for review. The TCLP results and the MSDS data are reviewed to determine whether the waste is hazardous and, if it is determined to be nonhazardous, whether combustion products of the waste would result in air emission permit violations.

This process takes a considerable amount of time on the part of all parties involved. For this reason, facilities may be turning away wastes which otherwise would be best disposed of in a municipal waste combustor. While the current approval system has emphasized the need for careful management of industrial wastes, the increasing number of requests for disposal of industrial wastes is affecting the MPCA's timeliness of approvals. To speed up the process of disposing of nonhazardous industrial waste, it is reasonable to require waste combustor owners and operators to plan ahead for what industrial wastes may be encountered in the facility's service area and to prepare an industrial waste management plan to deal with the waste.

Wastes that are determined to be hazardous must be disposed of at a hazardous waste landfill or incinerator.

As landfills implement their industrial waste management plans, increasing amounts of waste are being rejected, and are consequently being sent for combustion. Additionally, industrial waste generators are becoming increasingly sensitive to longterm liabilities associated with landfill cleanup costs. Consequently, more industries are seeking out incinerators to manage certain types of waste.

As stated previously, many waste combustor owners and operators consider MPCA approval of a waste apparently as a guarantee of delivery of approved waste. Since the MPCA has no way of controlling what waste is actually delivered to a facility, it would be impossible for the MPCA to make any such guarantee. The MPCA's current system of approval of industrial waste disposal requests serves only to confirm that incineration of the waste is acceptable based on data submitted by the waste combustor owner or operator. One objective of this part is to make it clear to the owner or operator of a waste combustor that it is the final responsibility of the owner or operator to determine it a waste can be accepted at a facility; approval of the waste for disposal by the MPCA does not reduce this responsibility or the associated potential liability. To ensure that the waste delivered is the waste that was approved, it is important for the facility owner or operator to maintain a system of inspecting and verifying waste deliveries. The proposed requirements of the industrial waste management plan make this clear.

The proposed rules provide a general framework for the development of a management plan by identifying the factors that must be considered in establishing a system to evaluate and inspect incoming wastes. Not all industrial wastes must be accepted by each facility. Waste combustor owners and operators operate sophisticated facilities. Managing industrial wastes is only one part of a waste combustors overall operation. It is reasonable to allow the facility owner or operator to choose the level of effort needed at the facility to manage industrial wastes.

a. **Subpart 1.** This subpart proposes the general guidelines for an industrial waste management plan. The plan shall be developed in accordance with the solid waste rules (part

7035.2535) and shall include provisions for removal of prohibited wastes as proposed in part 7011.1220 of this rule. Since the solid waste rules apply to all solid waste management facilities, it is reasonable to require waste combustor owners and operators to comply with the applicable provisions of that rule.

b. Subpart 2. This subpart proposes five additional industrial wastes which must be addressed in a waste combustors industrial waste management plan (when compared to the current list in the solid waste rule). These wastes are: spilled fossil fuel and the sorbents used to collect them, infectious and pathological wastes, used oil filters, problem materials as defined by Minnesota Statutes, and any unidentified wastes that would have an adverse effect if it were incinerated. These additions were made due to special handling requirements. The wastes may be flammable or infectious or in some other way dangerous or difficult to handle. To protect the health and safety of the waste combustor personnel, it is reasonable to require the industrial waste management plan to address these wastes in addition to those that must be addressed under the solid waste rule.

As an example of industrial wastes that require special handling but are nonetheless best handled by incineration, municipal waste combustor operators frequently receive requests to incinerate fuel spills sorbents. The sorbents are typically made of polyethylene (a nonchlorinated plastic) and are typically soaked with gasoline and diesel fuels. The MPCA Spills teams often requests disposal of this material at waste combustors because of the fuels in the sorbents. Because cleanup requests are frequent, consist of only sorbents and fuel, and are best disposed of by incineration, the MPCA believes that waste combustor operators should develop industrial waste management plans to accept sorbents without first having to seek approval from the MPCA. Because this waste is flammable, it requires special handling and therefore is included on the list. The industrial waste management plans should contain the waste combustor's procedure for accepting, storing and combusting these materials.

c. **Subpart 3.** This subpart proposes that when management practices for these wastes change, the waste management plan shall be modified to address the changes. This subpart also requires the approval of the commissioner for those changes. It is reasonable to require the industrial waste management plan to be kept up-to-date. The modifications required to the plan should be minimal since the reason for requiring the plan is to encourage the owners and operators to plan ahead for the industrial wastes that the will likely encounter at their facility. It is reasonable to keep the plan and its approval up to date to avoid last minute, rush approvals and to avoid inapproporiate industrial waste disposal.

13. Reasonableness Of Part 7011.1255-- Plan To Separate Solid Wastes Which Contain Mercury

The following discusses the reasonableness of the proposed requirement for a plan to separate, before combustion, solid wastes which contain mercury from the waste stream of waste combustors without add-on mercury pollution control equipment.

This proposed rule requires a waste combustor owner or operator to prepare a plan that would identify, separate, and collect wastes which contain mercury before combustion.

The standards of performance contain mercury emission limitations for Classes A, B, C, I, and II, waste combustors. Mercury is a highly volatile metal. Mercury will leave the waste combustor system in the flue gases rather than fly and bottom ashes (Ref. 168). Currently, mercury removal from the flue gas stream first requires the flue gas conditioning achieved during acid gas removal. Acid gas control equipment is very expensive. Once an acid gas control system is installed and in use on a waste combustor, the addition of mercury control equipment is relatively inexpensive. Separating wastes that contain mercury for treatment and disposal other than incineration will reduce mercury emissions from all waste combustors (with or without mercury control equipment). Because mercury is a pollutant with significant impacts on the environment, it is reasonable to remove as much mercury as possible from the waste stream before incineration.

Please see this SONAR at Part III for a full discussion of the need to control mercury emissions and Part IV for a discussion of emission limits.

Proposed part 7007.0501 requires the permit to contain a plan for the removal of wastes from the waste stream that contain mercury before the wastes are combusted. In order to develop a permit condition that is appropriate to the generator of the waste and the type of waste being incinerated, the permit applicant is being required to develop the waste separation plan as a part of its permit application.

The proposed rule requires the waste combustor permit applicant to specifically examine the waste stream to separate batteries, electrical devices and switches, lighting components, and solid wastes from labs using mercury. The permit applicant is required to identify other significant sources of mercury in the waste stream that would be incinerated. Those other sources will depend upon the activities of the waste generators.

Uses of mercury include barometers, thermometers, hydrometers, pyrometers, mercury arc lamps, switches, fluorescent lamps, mercury boilers, the manufacture of mercury salts, mirrors, as a catalyst in the oxidation of organic compounds, in extracting gold and silver from ores, electrical rectifiers, as a cathode in electrolysis/electroanalysis, in the manufacture of pulp and paper, in batteries, in amalgams, as a laboratory reagent, as a lubricant, in caulks and coatings, as a slimicide and in pharmaceutical and agricultural chemicals. Mercury is also found in other products as a process contaminant (Ref. 169).

In January 1991, a national study was completed that identified the products that contain mercury that are found in MSW. Household batteries, electric lighting components, thermometers, thermostats and pigments are the primary sources of mercury in the MSW stream. The results are shown in Table 36.

Table 36.
Discards of Mercury in Products in the Municipal
Solid Waste Stream, Short Tons
(Ref. 170)

Product	1989	2000
Household Batteries		
Alkaline	443.6	0.0
Mercury Zinc	182.5	101.8
Others	5.8	0.0
Subtotal	**631.9**	**101.8**
Electric Lighting		
Fluorescent Lamps	32.9	46.2
High Intensity Lamps	0.8	0.7
Subtotal	**33.7**	**46.9**
Fever Thermometers	16.3	16.8
Thermostats	11.2	10.3
Pigments	10.0	1.5
Dental Uses	4.0	2.3
Special Paper Coating	1.0	0.0
Mercury Light Switches	.4	1.9
TOTAL	**708.5**	**181.5**

Mercury discards in MSW appear to have peaked in 1986, and appear to be declining in response to widespread pressures to reduce the use of toxic metals in consumer products.

While the overall use of mercury is declining, from recent sales trends of batteries, Kearney and Franklin predict that batteries will remain the primary source of mercury in the waste stream.

By 1999, it is expected that all household batteries sold (except mercury zinc batteries) would be mercury free. Alkaline and nickel cadmium batteries will become the dominant portable energy source of the future. The mercury from batteries disposed of in the waste stream in the year 2000 is expected to be entirely from mercury zinc batteries. These batteries are used in transistorized equipment, hearing aids, electronic watches, pocket calculators, cameras, radios, smoke detectors, garage door openers, and tape recorders.

In industrial applications, mercury is used in regulated power supplies, radiation detection meters, portable potentiometers, electronic computers, voltage recorders, scientific and military equipment, depth finders, sonobuoys, emergency beacons, rescue receivers, and surveillance sets. Mercury zinc cylinder cells are also produced. These batteries are used in medical and military equipment, including pagers, oxygen monitors, fetal monitors, portable EKG monitors, and night vision goggles. Mercury zinc batteries have a long life, a high capacity-to-volume ratio, steady discharge rates, higher sustained voltage under load, and high resistance to shock, vibration, vacuum, pressure, corrosive atmospheres, and high humidity.

In Minnesota, the Legislature has taken steps to minimize the amount of mercury that is disposed of in the solid waste streams. During the 1990, 1991, and 1992 Legislative sessions, restrictions on the manufacture of batteries with mercury were developed, and collection programs for batteries with mercury were required of the battery manufacturers that sell the batteries in Minnesota. These requirements for battery management are presented more fully in the discussion of the reasonableness of proposed rule pt. 7007.0501, Subp.6. Minn. Stat. 325E.125, subd. 2(d) specifically prohibits the sale after February 1, 1992 of batteries which use mercuric oxide as an electrode. The Commissioner of the MPCA may grant an exemption for a specific type of battery if no substitute is available.

Items containing mercury other than batteries are banned from the waste stream. Thermostats, thermometers, electric switches, appliances, medical or scientific instruments, and fluorescent or high intensity discharge lamps, lighting fixtures or hardware from which mercury has not been removed may no longer be placed in the municipal waste stream. Products that contain mercury must be labeled, and those products currently containing mercury must be reused, recycled, or otherwise managed to ensure that the mercury is not placed in the solid waste stream or wastewater disposal systems. Minn. Stat. 115A.932.

Minnesota's county solid waste programs are incorporating these various bans into their solid waste management plans. Public education is necessary to ensure that the bans are known and implemented. With the statutory bans on mercury in the waste stream, it is expected that the amount of mercury disposed of will decrease substantially. A corresponding reduction in mercury emissions will occur over the next several years, as these educational programs are developed and implemented.

a. Mercury in Medical Waste

The MPCA's quantitative study of the content of medical waste, and subsequent air emissions from incinerating medical waste showed a correlation between cadmium and mercury emission rates and between mercury emissions and the amount of red rubber in the waste stream. Although direct analysis of red rubber for mercury content was not conducted, the implication is that it may contain a significant quantity of mercury (Exhibit 1, pp. 3-4). Because of the use of mercury zinc batteries in medical equipment, mercury zinc batteries will remain a significant source of mercury in the medical waste stream.

Large sources of elemental mercury waste at most hospitals include broken or obsolete equipment. Mercury from broken equipment can be recovered and reused. Spilled mercury may not be frequently recovered at healthcare facilities that have equipment containing mercury (Ref. 171). Solid state electronic sensing devices are being substituted for mercury-based thermometers and blood pressure instruments. It therefore becomes important that the obsolete equipment be separated and managed. Mercury reservoirs from these sources could be recycled (Ref. 172).

b. Industrial Waste Generators

As discussed in the statement of need, the rising costs of solid waste disposal will cause businesses and industries to consider incinerating some portion of their wastes on site. The requirement to investigate sources of mercury in the waste stream, and separate these wastes for separate management applies to these generators as well.

The primary sources of mercury in industrial waste streams will depend on the type of industry. In 1982 and 1986, electrical products, batteries, fluorescent light bulbs, switches and other control equipment accounted for 50 to 56 percent of the mercury used in the United States. Mercury used in chlorine and caustic soda preparation accounted for 12 to 25 percent of the total mercury used, paint manufacturing (10 to 12 percent), and dental preparations (3 percent) (Ref. 173). If an industry manufactures products that use paints or dyes that contain mercury, the product will contain mercury. It is clear that if mercury is used in the course of manufacturing a product, waste product and spillage will contain mercury.

c. Feasibility

It is feasible for waste combustor owners and operators to meet the requirements of this part. First, the applicant must develop the plan to identify wastes, and develop a means of separating and collecting the wastes before the mercury in the wastes is combusted. The applicant will develop the plan based on the applicant's familiarity with the waste stream, the resources the applicant has to separate and collect the wastes and the effectiveness of removing sources.

The proposed rule requires that with each application for permit renewal, the applicant must further revise the plan to improve the identification of wastes, and the separation and collection of wastes that contain mercury. Revising the plan on a routine basis will allow a waste generator to revise separation and collection programs to better track sources of mercury, and even to cease separating a waste if a substitute for mercury in the initial product or process is found.

The plan is required to contain the name and title of a person responsible for implementing the plan, describe the wastes and generators being targeted under the plan, and describe the methods used to separate and dispose of the mercury. An estimate of the amount of mercury separated under the plan is also required. Waste that contains mercury will need to be managed potentially as a hazardous waste. That determination is based on the concentration of mercury in the wastes. The MPCA must ensure proper storage and handling of this waste. For these reasons, it is reasonable to require these items in the plan.

d. Impacts

Because waste generators identify sources of mercury in their waste stream, collect, store and dispose of these wastes, there will be a corresponding interest in finding a replacement to that product or material. Increased pressures to minimize the use of mercury in products will also result. These two activities will result in a long-term, overall reduction in mercury in the waste stream.

As the permit applicant prepares the plan, the permit applicant has control over how the plan is prepared, and the wastes that are targeted under the plan. It is expected that since the plan will be implemented as required under proposed rule 7007.0801, the permit applicant will generate a plan that the permit applicant believes to be feasible. Further, because statute prohibits the disposal of mercury in the solid waste stream, the plan will ensure that the permit applicant complies with state law.

14. Reasonableness of Part 7011.1260--Continuous Monitoring

The following addresses the reasonableness of the proposed emissions and operating parameters continuous monitoring systems requirements.

Continuous monitoring provides a record of the emissions and operating parameters that is as complete as practicable and is as close to real-time as possible. It also provides operating and emissions information for the benefit of the waste combustor personnel. CEMS (continuous emissions monitoring system) data are used to make adjustments in operations during the combustion of waste. Carbon monoxide monitors are not a part of the combustion control process but rising CO levels will indicate operating problems. For example, high CO levels are caused by fuel feed rate problems or low combustion temperatures (Ref. 174). High opacity readings may indicate a problem in the particulate matter control device.

Because the federal regulations include requirements for continuous monitoring of emissions and operating parameters, it is necessary that Minnesota's proposed rule also includes such requirements order to be at least as effective as the federal rules.

The federal regulations require continuous monitoring of emissions and operating parameters of large and very large municipal waste combustors (Classes I, A, and B). In the EPA's proposal for the regulation of small municipal waste combustors, it is their intention to require continuous monitoring on small municipal waste combustors, Classes II and C (54 FR 52297 and 52250). The proposed rule reflects these current and proposed rules. Additionally, the proposed rule requires continuous monitoring of Class III and D waste combustors operating parameters (combustion chamber temperature, CO, opacity and O_2) and, for Class IV waste combustors, continuous monitoring of the combustion chamber temperature. For the MPCA, these monitors provide the minimum information from which a judgment regarding combustion conditions during incineration of waste can be made (i.e.. was good combustion practice followed). The information obtained is important to the operator in the implementation of good combustion practice (GCP) and can be used to improve combustion conditions and reduce emissions. It is reasonable to require at least the minimum level of information necessary from which a judgment can be made regarding the operating conditions under which waste is incinerated.

Additionally, under the direction of the Legislative Audit Commission of May 1990, the MPCA is to increase the information it collects on pollution levels. Continuous monitoring will increase both the quantity and the quality of the information received from these sources.

For these reasons, it is necessary and reasonable to require continuous monitoring of emissions and/or operating parameters of all classifications of waste combustors.

a. **Subpart 1. Combustion Chamber Temperature Monitoring.** The combustion chamber temperature is an important parameter to monitor to ensure waste combustor operations are in accordance with good combustion practice, that the waste combustor operates within the design envelope, and to ensure compliance with the proposed emission limits. This subpart requires the owner or operator of a waste combustor of any classification to install and operate a continuous combustion chamber temperature monitor at a point one second after the last overfire air or secondary air has entered the combustion chamber. An alternative to monitoring the temperature of the combustion gases at this point is to map the temperatures in the combustion chamber during operation and to provide a correlation between the temperature at that point and another point that may be easier to monitor. This would be allowed if there was a concern about temperature monitors not being able to withstand the temperature of the combustion chamber. In that case, the monitoring could be done at a point where the temperature is lower. For reasons of flexibility, it is reasonable to provide an alternative location at which to monitor the combustion gases temperature.

Class III and D waste combustors are waste combustors used at industries like Andersen Windows Corporation and large medical facilities like Mayo Clinic. Continuous monitors (like the proposed temperature monitor) at these facilities monitor operating parameters and are used to ensure that a waste combustor is operated within its proper envelope. If these waste combustors operate outside that envelope, they have the potential to emit significant quantities of pollutants like dioxins. Continuously monitoring the combustion chamber temperature provides an effective tool in determining the compliance status of a waste combustor and in verifying that a waste combustor was operated in accordance with good combustion practice. For this reason, it is reasonable to require continuous monitoring of the combustion chamber temperature of Class III and D waste combustors.

Part 7011.1235, subp. 2 of the proposed rule requires the design of the combustion chamber of a Class IV waste combustor to be such that the combustion gases maintain a temperature of at least 1800 degrees Fahrenheit for one second after the last overfire air or secondary air has entered the combustion chamber. Temperature monitoring is necessary to ensure that the operator complies with this requirement.

Good combustion practice must be followed in order to comply with the emission limits. An effort was made to reduce the burden on small business as much as possible. For this reason, a Class IV waste combustor is required to continuously monitor only the combustion chamber temperature. This is a relatively inexpensive monitor.[22] To further reduce the burden on small business, the rule is written in a manner that does not exclude the use of a strip chart recorder and hand calculation of the average combustion chamber temperature. The required temperature measurement frequency is low enough that the reading can be taken from a strip chart rather than requiring a dedicated computer (or other such microprocessor-based equipment) to record and calculate the average temperature. Ten measurements per hour are proposed rather than possibly hundreds or thousands of readings per hour (which a computer is easily capable of). The MPCA has a duty to minimize the burden on small business as much as possible.

It is reasonable to require the continuous monitoring of the combustion chamber temperature to monitor that the waste combustor is being operated properly. Combustion chamber temperature monitoring is the least expensive, minimum method of verifying that an incinerator is being properly operated.

22 Telephone conversation between Mr. Steven Zeleny of MultiService, Inc. and Ms. Anne Jackson of Minnesota Pollution Control Agency on July 8, 1992.

b. **Subpart 2. Particulate Matter Control Device Temperature Monitors.** Subpart 2 adopts the federal requirement set forth in 40 CFR 60.58a(h)(7) and requires the owner or operator to install and operate at all times temperature monitors that continuously read and record the flue gas temperature at the inlet to the most efficient particulate matter control device.

The purpose of regulating and monitoring this temperature is to minimize the formation of dioxins. The formation of dioxins occurs on the surface of fly ash particles and is strongly dependent upon the duration at which a particle spends at the temperature range of 300 to 750 degrees Fahrenheit. This includes the typical range at which many particulate matter control devices operate. The concentration of dioxins can increase when exhaust gases pass through a particulate matter control device operated in this temperature range (Ref. 175). Currently, there are no methods to continuously monitor the emissions of dioxins (Ref. 176). For this reason, dioxin emission compliance is determined by stack testing. Stack tests are complicated, expensive and represent only a moment in the overall operation of the waste combustor. It is neither reasonable nor efficient to require frequent stack tests.

Since it has been determined that the formation of dioxins has a strong dependency upon the operating temperature of the particulate matter control device and continuous monitoring of this temperature is straight forward and inexpensive, it is reasonable to require the owner or operator of a waste combustor to continuously monitor this parameter. While the federal regulations currently apply only to Classes I, A and B, dioxin formation in particulate matter control devices can occur in smaller facilities also. Therefore, it is reasonable to require particulate matter control device inlet flue gas temperature monitoring on any waste combustor with post combustion particulate matter control.

The federal regulations (as incorporated in pt. 7011.1240, subp. 2), require that during operation, the flue gas temperature at the inlet to the most efficient particulate matter control device shall not exceed by more than 30 degrees Fahrenheit the average temperature recorded at that point during the most recent performance test at which the PCDD/PCDF emissions limit was achieved. To determine compliance with this requirement, it is necessary to monitor the flue gas temperature at this point. To maintain consistency with the federal regulations and since dioxins cannot be continuously monitored, it is reasonable to adopt the continuous temperature monitoring requirement as a surrogate to continuous dioxin monitoring.

c. **Subpart 3. Continuous Monitors.** Subpart 3 adopts the federal requirements set forth in 40 CFR 60, subp. Ea and Ca, regarding which emissions and operating parameters in addition to temperature, are to be monitored in Classes I, A, and B waste combustors and extends the applicability of some of the monitoring requirements to Classes II, III, C, and D.

Item A. Item A adopts the list of operating parameters and emissions monitoring required of Class I, A, or B waste combustors. To maintain consistency with the federal regulations, it is reasonable to adopt these requirements. Under the proposed rule, waste combustor Classes II, III, C, or D are required to monitor the same operating parameters. For the very same reasons that it is reasonable and important for these parameters to be monitored for waste combustor Classes I, A, or B waste combustors, it is reasonable and important for them to be monitored for Classes II, III, C or D. The operating parameters to be monitored are important parameters in the implementation of good combustion practice and compliance determination. Records of these parameters can indicate problems in the operation of a waste combustor. For these reasons, it is reasonable to require that these parameters are monitored and recorded at waste combustor Classes I, II, III, A, B, C, and D.

Subitem 1. Subitem 1 adopts the federal requirements set forth in 40 CFR 60.58a(h)(3) and requires the owner or operator to monitor carbon monoxide emissions at the waste combustor outlet. The proposed rule extends this requirement to Classes II, III, C, and D waste combustors. A general correlation has been found between carbon monoxide emissions and dioxin emissions. The proposed dioxin emission standards are based upon the implementation of good combustion practice. Carbon monoxide emissions are an indicator of combustion conditions. Since the proposed rule contains dioxin limits and it is currently not possible to continuously monitor dioxins, it is reasonable to require waste combustor owners and operators to install and operate carbon monoxide continuous emissions monitors as a surrogate to monitoring dioxins directly.

Subitem 2. Subitem 2 adopts the federal regulation set forth in 40 CFR 60.58a(h)(6)(i) and requires the owner or operator to monitor steam production in waste combustors which recover waste heat with a boiler. Steam loading and operating level for the purposes of this rule are synonymous. Under the federal regulations and the proposed rule, steam loading is used to determine a waste combustor's "maximum demonstrated capacity". Under the proposed rule, a waste combustor's capacity is stated as the amount of heat input from the waste burned. In the past, a unit's capacity was stated in terms of pounds per hour. The waste burned in waste combustors has changed significantly from several years ago and it is likely that the waste will continue to change. This means that the heat content of the waste has also changed. It is reasonable to base a unit's capacity on the heat input for which a unit is designed because heat input is a factor that doesn't change.

The federal regulations apply only to Class A, B and I waste combustors, however, it is just as important for Class C, D, II, III and IV waste combustors to be operated within the envelope for which each was designed. Operating a waste combustor within the range for which it was designed is an important part of good combustion practice. Emissions can be increased when a waste combustor is operated either significantly above or below its design capacity.

A waste combustor's "maximum demonstrated capacity" is the operating level at which it was demonstrated that the waste combustor complies with the dioxin emission limits. For Class IV waste combustors, for which there is no dioxin limit, it is the operating level at which the unit demonstrates compliance with the PM and CO emission limits. It is likely that the "maximum demonstrated capacity" will change as a waste combustor ages or the waste stream changes, and must be periodically redetermined. In accordance with good combustion practice and the proposed rule, waste combustor operators monitor steam loading to determine that the waste combustor is operated at no more than 110 percent of the "maximum demonstrated capacity". Since it is reasonable to require that a waste combustor is operated at a level at which its emissions have been demonstrated to be within the limits, it is also reasonable to require continuous monitoring of the operating level or steam load.

Subitem 3. Subitem 3 adopts the federal requirements set forth in 40 CFR 60.58a(b)(8) and requires the owner or operator to monitor flue gas opacity at a location downstream of the pollution control equipment. The proposed rule requires continuous monitoring of flue gas opacity for Class I, II, III, A, B, C, and D waste combustors. The opacity of the flue gases is an indication of the quantity of visible particulate matter in the gases. In this way, monitoring opacity acts as a surrogate for monitoring particulate matter emissions, for which there currently is no method of continuous monitoring. Opacity monitoring is also used to detect significant failures in the pollution control equipment. The opacity limit is established at a level at which the operator of the unit must take immediate action to correct a problem. For these reasons, it is reasonable to require continuous monitoring of the flue gas opacity.

Code of Federal Regulations 40, Subpart Dc applies to industrial-commercial-institutional steam generating units. This regulation applies to units with steam generating capacities' 10 MMBtu/hr and greater burning coal, oil, gas, wood and wood scraps. Boilers burning wood scraps are defined under the proposed rule as waste combustors. Subpart Dc applies to those units. In general, Subpart Dc applies to units that burn fuels that have lower particulate matter emissions than waste combustors. For this reason, it is reasonable to require continuous opacity monitors on Class III and D waste combustors. In consideration of reducing the financial burden on small business, Class IV waste combustors are not required to install and operate opacity monitors. Compliance with the opacity limit is determined by a qualified observer using Method 9.

Subitem 4. Subitem 4 requires the owner or operator to continuously monitor either oxygen or carbon dioxide content of the exhaust gases. The data collected from these monitors are used to correct pollutant concentrations to standard conditions in order to compare them to the proposed rule's emission limit for that pollutant. The federal regulations state the emission limits in terms of the oxygen concentration in the exhaust gases. The federal regulations also offer the option of determining emission limit compliance using carbon dioxide measurements corrected to an oxygen content (provided that the correlation has been made between the two during the most recent stack test). This implicitly requires the owner or operator to continuously monitor either the carbon dioxide or oxygen content of the exhaust gases. The proposed rule makes this requirement explicit. This provides the owner or operator with a complete list of emissions and operating parameters that are required to be continuously monitored. It is reasonable to explicitly state the requirement that the owner or operator shall continuously monitor the carbon dioxide or oxygen content of the exhaust gases. Nearly all municipal waste combustors operate an oxygen or carbon dioxide continuous monitor already.

Item B. Item B adopts the federal requirements set forth in 40 CFR 60.58a(e)(6) and requires the owner or operator of a waste combustor that is subject to nitrogen oxides emission limits to monitor nitrogen oxides emissions at a location downstream of the pollution control equipment. Nitrogen oxides are acid gasses and contribute to the problems associated with acid rain. Acid rain is responsible for much damage to the natural and man made environments. Since continuous monitoring is required by the federal regulations and the damage caused by NOx emissions is significant, it is necessary and reasonable to adopt these requirements. Nitrogen oxides emission limits have been established for Class I waste combustors. Currently there are no Class I waste combustors in Minnesota. The proposed Dakota County waste combustor would be a Class I facility. Due to federal PSD (Prevention of Significant Deterioration) regulations, HERC is required to monitor its NOx emissions. Since no other waste combustors are subject to a NOx emissions limit, it is reasonable to not require continuous monitoring for NOx of those waste combustors.

Item C. Sulfur dioxide is also an acid gas which also contributes to the problem of acid rain. Item C requires owners and operators of waste combustors that are subject to a sulfur dioxide (SO_2) limit to install a continuously monitoriny system for SO_2 emissions. Items C adopts the federal requirements set forth in 40 CFR 60.54a(c) and (d) which allows the owner or operator of a waste combustor to demonstrate compliance with the sulfur dioxide emission limit on a percent emission reduction basis instead of a flue gas concentration basis. Item C also requires those facilities which choose that option to install monitors at the inlet and outlet of the air pollution control system. It is reasonable to allow this option and to require owners and operators that choose it to install and operate monitors at the inlet and outlet of the air pollution control system.

d. **Subpart 4. Averaging Periods.** Subpart 4 establishes the time periods over which the emission and operating parameter measurements are averaged and the method of calculating that average. The averaging periods and the emission limits are very closely related. For a given emission limit, the period of time over which emissions are averaged can have a significant influence upon whether or not a facility can comply with the limit. Generally, a shorter averaging period results in a higher emission limit.

It is desirable to establish an averaging period as short as practicable to avoid "averaging-out" abnormal variations or upsets in the parameter or pollutant that is being monitored. By establishing short averaging periods, quick action is required by waste combustor personnel to correct the cause of higher than normal emissions. This results in lower emissions over the long term. However, the averaging period must be long enough to allow for normal variations in the process without creating a violation of the limit. Therefore, an effort is made to balance these two conflicting goals (Ref. 177). With the exception of item A, all the requirements itemized in this subpart are adopted from the federal requirements set forth in 40 CFR 60, subpart Ea. To maintain consistency with the federal regulations, it is reasonable to adopt these requirements.

Federal regulation 40 CFR 60, subpart Ea, sets forth the requirement that the one-hour averages shall be based on at least two equally spaced measurements per hour. Currently, through permit conditions and under Minn. Rules pt. 7017.1000, all one-hour averages are to be based on at least four equally spaced measurements per hour. Since owners and operators of sources for which CEMS are a requirement are currently complying with the requirement of four measurements per hour, it is reasonable to maintain this requirement.

Item A. Item A establishes four-hour block arithmetic averages of four one-hour arithmetic averages of at least 10 data points equally spaced in time for the combustion chamber temperature required under pt. 7011.1260, subp. 1, and for the inlet flue gas temperature of the particulate matter control device as required under pt. 7011.1260, subp. 2.

All municipal waste combustors in Minnesota monitor the temperature of the combustion chamber as a means of evaluating and controlling the combustion process. Most waste combustors' controls are designed to automatically control the introduction of combustion air and/or auxiliary fuels based on the combustion chamber temperature. The dioxin emission limits established for municipal waste combustors by the EPA in 40 CFR 60, subparts Ea and Ca, are based on the implementation of good combustion practice by the operator and maintenance, within a range, of the particulate matter control device inlet flue gas temperature. Good combustion practices are based, in part, on maintaining the combustion gases at a sufficient temperature for a sufficient amount of time to assure destruction of organic constituents. Because Classes D, III and IV waste combustors have less sophisticated combustion control equipment and less pollution control equipment, it is even more important for these classifications to monitor and record the combustion chamber temperature. Because dioxins have been found to form in particulate matter control devices, it is very important to monitor and control the operating temperature of these devices. For these reasons, it is reasonable to require owners and operators of all waste combustors to monitor and record these temperatures.

The federal regulations do not specify the sampling rate required to determine the stated average temperatures. Clarification from the EPA of the minimum sampling rate requirement will not come in the near future[23]. By establishing a minimum sampling rate, a point of confusion in the federal regulations is clarified. An integrated average of an analogy temperature record could be used. This, however, is impractical. It could be very expensive for a small hospital to purchase the equipment necessary to perform the integration. With a modern digital computer, the integration is still a numerical integration of a discreet number of points and not a true integration of a continuous curve. The differences, however, are negligible due to the extremely high sampling rate of most temperature monitoring equipment. By establishing a minimum sampling rate of ten points per hour, however, a small facility can determine through hand calculations the average temperature from a strip chart temperature record. This minimum sampling rate should not discourage large facilities with the capability to calculate an integrated average from doing so. For one reason, an integrated average would even out spikes. For these reasons, it is reasonable to establish a minimum sampling rate and to establish that rate at ten data points per hour.

Item B. Item B adopts the federal requirement set forth in 40 CFR 60.58a(h)(6)(i) and establishes a four-hour block averaging period for steam load measurements. This requirement applies to all waste combustors that recover heat by generating steam. Since the steam generated from burning waste fluctuates with the heat content of the waste, it is necessary to specify an averaging period. To maintain consistency with the federal requirements, it is reasonable to adopt this averaging period.

Item C. Item C adopts the federal requirements set forth in 40 CFR 60.58a(h)(1), and 60.58a(h)(2) and establishes the averaging periods and sampling rate for carbon monoxide emissions continuous monitoring. This requirement applies to all waste combutors that are required to continuously monitor CO emissions. The averaging periods differ with the type of waste combustor. This is a reflection on the variability of combustion conditions for mass burn rotary waterwall and RDF waste combustors when compared to other waste combustors (Ref. 178). Mass burn rotary

23 Telephone conversation between Mr. Jeff Telander of U.S. EPA and Mr. Mondloch of Minnesota Pollution Control Agency on September 22, 1992.

waterwall and RDF waste combustors have a 24-hour daily arithmetic averaging period; other waste combustors have a four-hour block averaging period. Both averaging periods consist of 24 or 4 one-hour arithmetic averages. For reasons given in the discussion of averaging, it is reasonable to establish as short an averaging period as practicable for the established emission limit even if this results in different averaging periods for different waste combustor designs. Also, to maintain consistency with the federal regulations, it is reasonable to adopt these requirements.

Item D. Item D adopts the federal requirements set forth in 40 CFR 60.58a(e)(7) and establishes the averaging periods and sampling rate for sulfur dioxide emissions continuous monitoring. The averaging period is 24 hours in length. The standard is the geometric average of the one-hour arithmetic average emission rates measured during each 24-hour period from midnight to midnight.

In developing the sulfur dioxide standard for municipal waste combustors, the EPA studied the emissions from four municipal waste combustors. The geometric average (compared to the arithmetic average) of the sulfur dioxide emissions was chosen because statistical analysis of sulfur dioxide emission data revealed that an average of the natural logarithms of the hourly emission rates produced better data on which to base the standard. By taking the logarithm of the hourly emissions data, the naturally high short-term variability in the sulfur dioxide emissions can be reduced. By doing this, it is easier to develop a standard that has a relatively short averaging period and is not extraordinarily high (Ref. 179). It is desirable and reasonable to establish averaging periods that allow emission limits that are as low as possible. No current Minnesota facilities will be required to continuously monitor for sulfur dioxide other than those required by the federal regulations (four Class A or B facilities).

Item E. Item E adopts the federal requirements set forth in 40 CFR 60.58a(g)(6) and establishes the averaging periods and sampling rate for nitrogen oxides emissions continuous monitoring. The averaging period is 24 hours in length. The standard is the arithmetic average of the one-hour arithmetic average emission rates measured during each 24-hour period from midnight to midnight. To maintain consistency with the federal regulations, it is reasonable to adopt these requirements. 40 CFR 60, subpart Ea, sets forth the requirement that the one-hour averages shall be based on at least two equally spaced measurements per hour. Currently, through permit conditions and under Minn. Rules pt. 7017.1000, all one-hour averages are to be based on at least four equally-spaced measurements per hour. Since owners and operators of sources for which CEMS are a requirement are currently complying with the requirement of four measurements per hour, it is reasonable to maintain this requirement. Due to federal PSD regulations, HERC is required to continuously monitor its NOx emissions. No other existing Minnesota facilities will be required to continuously monitor for nitrogen oxides. Newly constructed Class I waste combustors (such as the one proposed for Dakota County) would be required to continuously monitor NOx emissions.

Item F. Item F adopts the federal requirements set forth in 40 CFR 60.58a(b)(8) and 60.13(e)(1) and establishes the averaging periods and sampling rate for continuous monitoring of the flue gas opacity. The averaging period is six minutes in length and averages 36 measurement taken at equal spacing in time over that period. To maintain consistency with the federal regulations, it is reasonable to adopt these requirements.

e. Subpart 5. Operation of Continuous Monitors. Subpart 5 establishes the operating requirements for continuous monitors. Minn. Rules pt. 7017.1000 sets forth the general requirements for operation of continuous monitors. In this subpart, specific provisions are proposed to reflect additional requirements set forth in the federal regulations that are not currently included in Minn. Rules pt. 7017.1000. It is necessary and reasonable to include in the proposed rule the provisions established in items A through H that reflect the federal regulations.

Item A. Item A adopts the federal requirements set forth in 40 CFR 60.59a(c) and requires the owner or operator to report the results of the initial CEMS compliance test.

Item B. Item B adopts the federal requirement set forth in 40 CFR 60.58a and establishes the minimum of 75 percent of the hours per day of valid data that are required to be obtained. To maintain consistency with the federal regulations, it is reasonable to adopt this requirement.

Item B also establishes, as a percentage, the minimum number of hours in a calendar quarter that the continuous monitors are required to measure and record data. Ninety percent of the facility's operating hours must be monitored. This requirement exceeds the federal regulations which require valid data for 75 percent of the hours of 75 percent of the days per month or equal to 56.25 percent of the hours per month. Currently, under the MPCA's air emission permit Exhibit B for continuous monitoring systems, all sources that are required to continuously monitor emissions or operating parameters are required to comply with the requirement that CEMS shall measure and record 90 percent of the hours the emissions unit is operated in a calendar quarter. Waste combustors that are currently required to have CEMS are complying with this requirement. CEMS equipment is reliable enough to meet this requirement and this is strictly enforced by MPCA Air Quality enforcement staff. Therefore, it is reasonable to continue to require this level of reliability.

Item C. Item C adopts the federal requirement set forth in 40 CFR 60.58a and establishes the requirement that all valid monitoring data shall be used in the calculation of emission rates, emission reductions and operating parameters even if the conditions set forth in item B are not met. This will produce emissions data that most closely reflects the actual emissions. It is reasonable to require that the most representative emissions data are reported.

Item D. Item D adopts the federal requirements set forth in 40 CFR 60.58a and establishes the requirements for how an owner or operator shall provide sufficient emissions data in the event that the requirements of item B of this subpart are not met for sulfur dioxide or nitrogen oxides emissions. Emission data calculations to determine compliance shall be made using other monitoring systems approved by the commissioner or Method 19 of 40 CFR 60, Appendix A.

Method 19 is a used to calculate emissions data based on a factor (F Factor) calculated during stack testing. The F Factor is a correlation between heat input and emissions of a particular pollutant. Since this is a federally accepted method of determining emissions, it is reasonable to allow the use of this or another approved method in the event that the continuous monitors fail.

Item E. Span and zero settings are adjusted during calibration of the CEMS. These settings may change (drift) over time. Item E requires the owner or operator to check this daily. This item adopts the federal requirement set forth in 40 CFR 60.13. This is a necessary provision of the federal CEMS rules that is currently not included in the Minnesota Rules. Since pt. 7017.1000 lacks this provision, it is necessary and reasonable to include it in the proposed rule.

Item F. Item F adopts the federal requirements set forth in 40 CFR 60.58a(e)(14) and establishes the span values for the continuous emissions monitor at the inlet and outlet of the sulfur dioxide pollution control device.

Item G. Item G adopts the federal requirements set forth in 40 CFR 60.58a and requires the owner or operator to perform quarterly accuracy determinations and daily drift checks. These shall be conducted in accordance with 40 CFR 60, Appendix F. Accuracy determinations are an important factor in determining the compliance status of a facility.

Item H. Item H adopts the federal requirements set forth in 40 CFR 60.58a and requires the owner or operator to install, evaluate and operate continuous monitoring systems in accordance with 40 CFR 60.13. Federal regulation 40 CFR 60.13 sets forth the minimum requirements for installation and operation of continuous monitors. It is reasonable to establish minimum requirements for consistency.

f. Subpart 6. Recording Data from Continuous Monitoring. Minn. Stat. § 116.85 requires the owner or operator of a waste combustor to maintain a permanent record of continuously monitored emissions. This subpart establishes what must be included in that record. It is necessary and reasonable to adopt the requirements set forth in State statute regarding the maintenance of CEMS records. Subpart 6 also adopts the federal list of records that are required to be maintained. To comply with Minnesota Statutes and to maintain consistency with the federal regulations, it is reasonable to require a permanent record of the Items A through C.

Item A. Item A adopts the federal requirements set forth in 40 CFR 60.59a(b)(1) and requires the owner or operator to include the calendar date in the permanent record.

Item B. Item B adopts the federal requirements set forth in 40 CFR 60.59a(b)(2)(i) and requires the owner or operator to include the material set forth in subitems 1 through 3 in the permanent record. The record shall be kept on paper and in computer-readable format. This will allow plant operators to keep records on a computer disk and to submit the disk to MPCA. This will ease report generating. It is reasonable to include all readings and averages so that reporting will not be done selectively.

Subitem 1. Subitem 1 adopts the federal requirements set forth in 40 CFR 60.59a(b)(i)(A) and requires the owner or operator to include all six-minute opacity readings in the permanent record

Subitem 2. Subitem 2 adopts the federal requirements set forth in 40 CFR 60.59a(b)(i)(B) and requires the owner or operator to include in the permanent record all one-hour average sulfur dioxide emission rates at the inlet and outlet of the acid gas control device if compliance is based on a removal efficiency, or at the outlet only if compliance is based on an emission limit.

Subitem 3. Subitem 3 adopts the federal requirements set forth in 40 CFR 60.59a(b)(i)(C) and (D) and requires the owner or operator to include in the permanent record all one-hour average carbon monoxide and nitrogen oxides emission rate, steam loading and particulate matter control device inlet gas temperature measurements. In order to determine compliance with pt.

7011.1235 subp. 2, this subitem also requires the permanent record to contain all one-hour average combustion chamber temperatures. Since the minimum combustion chamber temperature is specified and continuous monitoring is required, it is reasonable to require a permanent record.

Item C. Item C adopts the federal requirements set forth in 40 CFR 60.59a(b)(2)(ii) and requires the owner or operator to calculate and include the averages set forth in subitems 1 through 4 in the permanent record. It is reasonable to require all averages to prevent selective reporting.

Subitem 1. Subitem 1 adopts the federal requirements set forth in 40 CFR 60.59a(b)(ii)(A) and requires the owner or operator to include all 24-hour daily geometric average percent reductions in sulfur dioxide emission and all 24-hour daily geometric average sulfur dioxide emission rates in the permanent record.

Subitem 2. Subitem 2 adopts the federal requirements set forth in 40 CFR 60.59a(b)(ii)(B) and requires the owner or operator to include all 24-hour daily arithmetic average nitrogen oxides emission rates in the permanent record.

Subitem 3. Subitem 3 adopts the federal requirements set forth in 40 CFR 60.59a(b)(ii)(C) and requires the owner or operator to include all 4-hour block or 24-hour daily arithmetic average carbon monoxide emission rates as applicable in the permanent record.

Subitem 4. Subitem 4 adopts the federal requirements set forth in 40 CFR 60.59a(b)(ii)(D) and requires the owner or operator to include in the permanent record all four-hour block arithmetic average load levels and particulate matter control device inlet gas temperatures.

g. **Subpart 7. Exceedances of Continuously Monitored Emission Limits** Subpart 7 establishes the operating requirements that an owner or operator of a waste combustor must comply with in the event of an exceedance of continuously monitored emission. Subpart 7 adopts the requirement set forth in Minn. Stat. § 116.85 (1992). The intent of this statute, and this subpart of the proposed rule, is to require waste combustors to shut down if repairs or modification required to return a facility to compliance cannot be completed within 72 hours of an exceedance of a continuously monitored emission occurs. To comply with Minnesota statutes, it is necessary and reasonable to adopt the following requirements:

Item A. Item A requires the owner or operator to report to the commissioner as soon as reasonably possible that an exceedance of a continuously monitored emission has occurred.

Item B. Item B requires the owner or operator to commence repairs or modifications within 72 hours of the exceedance.

Item C. Item C requires the owner or operator to shut down the waste combustor if it cannot be returned to compliance within 72 hours or if the required repairs or modifications require an amendment to the facility's permit.

Item D. Item D requires the owner or operator to demonstrate compliance upon completion of the repairs or modifications. Compliance is to be determined by testing. The owner or operator is required to notify the commissioner ten days in advance of date on which compliance testing is to be conducted. This provides the MPCA sufficient time to provide an enforcement person to witness the testing. The notification shall also provide the commissioner with the startup date.

15. Reasonableness of Part 7011.1265--Performance Test Methods and Procedures

The following addresses the reasonableness of the performance test methods and procedures required to demonstrate compliance with the proposed standard. In the following discussion where federal regulations are cited, the citation generally applies only to waste combustor Classes I, A, and B. These are the classes to date for which federal regulations have been promulgated. In the proposed rule, many of the federal requirements have simply been extended to include some or all of the remaining classifications (II, III, IV, C, and D). It is reasonable to extend the methods to Classes II, III, IV, C, and D because emissions limits based on these methods have also been proposed for those classes.

Code of Federal Regulations Title 40 part 60.24(2) requires that SIPs contain test methods for determining compliance with the standards. The proposed rule establishes methods to determine a waste combustor's compliance status with the proposed emission and operating parameters limits. In order to determine compliance, these emissions and operating parameters must be measured. They must be measured in the same manner each time and for all waste combustors. The methods proposed have been developed by the EPA for the purpose of measuring these particular emissions and are the standard methods used throughout the country. The MPCA has proposed some modifications to the federally mandated methods to more accurately characterize emissions.

In order for the MPCA to determine compliance with an emissions limit, the MPCA must specify a method for measuring the emissions, and a period of time over which that measurement must be conducted. Specifying a standard test method will ensure accurate and reproducible sample collection and analysis. A sampling period, specific to the pollutant measured, is necessary:

1) to ensure enough of a pollutant is collected to achieve desired detection levels in the analysis;
2) to ensure that natural variations of emissions are not isolated to be misinterpreted as representing "normal" emission conditions; and that
3) sustained peaks in emissions are not eliminated by sampling periods that are too long.

Some pollutants are emitted at a constant concentration or rate, while come pollutants are not. At waste combustors, variations in waste feed content and physical characteristics occur. Operation of the combustion unit must then be varied in response to the waste feed. Pollution control equipment is designed to control emissions over the whole range of emissions, however, emissions will still fluctuate.

This variation of air pollution generators is accounted for in Minnesota's rules related to the conduct of performance tests. Minn. Rules pt. 7017.2000, subd. 5 (1991) requires that each performance test shall consist of three separate runs using the applicable test method. The commissioner reserves the right to require more than three runs under unusual circumstances. This subpart states that for the purpose of demonstrating compliance with an applicable standards, the arithmetic mean of the three runs shall apply. In the event that a sample is lost or a test run cannot be completed, the commissioner may use two runs to determine compliance.

This statistical treatment of the data takes into account the measurement errors of the testing methods, as well as the variability of the process being measured.

When performance testing is conducted, samples of the flue gas are drawn through a "sampling train" specific to the pollutant being measured. The sample that is collected is an integrated sample (collects all of the pollutant during that sampling period). The longer the sample period, the more pollutant is collected, and more of the operation of the facility is measured.

There are practical limitations with sampling continuously for very long periods. With very long sampling periods, care must be taken not to exhaust the capture ability of impinger solutions used in the sampling train. The cost of engaging an independent testing laboratory to collect large samples has historically been prohibitive to permittees. Long sampling periods also do not provide information about how the pollutant was emitted. The pollutant may have been emitted at a steady rate throughout the run, or the pollutant may have been resulted from a single peak emission.

It is desirable to establish a sampling period as short as practicable to avoid "averaging-out" abnormal variations or upsets in the parameter or pollutant that is being monitored.

On the other hand, sampling runs that are too short do not adequately assess "normal" operations of an emission facility. Sampling periods that are too short cause single individual measurements to be isolated, and potentially misrepresent emissions for a facility as very high, or very low, depending on when the samples were collected.

A balance of all these concerns then is necessary. A sampling period must be specified that achieves the detection levels for a pollutant, must be short enough to be financially viable, but must be long enough to account for normal variations in the emission concentration or rate.

a. **Subpart 1. Performance Methods and Procedures.** This subpart sets forth the general requirement that performance tests shall be conducted in accordance with the methods specified in Minn. Rules pt. 7017.2000 except as modified in this part. Minn. Rules pt. 7017.2000 sets forth the general test methods and procedures that must be followed when compliance determination tests are conducted in Minnesota. Part 7017.2000 references tests methods described in the Code of Federal Regulations and modifies them to further specify conditions of testing where the federal methods are vague or lack specifications. This subpart also states that under test conditions in which the operation of a sorbent injection system is discontinued, this change does not constitute a modification as described under part 7007.0100, subp. 14. This allowance is in accordance with the promulgated federal regulations for waste combustors 40 CFR 60.56a(e)(16) and is necessary in order to determine the acid gas emission reduction achieved by a furnace sorbent injection system.

b. **Subpart 2. Performance Test Methods for Criteria Pollutants.** The criteria pollutants that are emitted by waste combustors and are regulated under this rule are particulate matter, sulfur dioxide and nitrogen oxides. This subpart specifies the test methods for determining the emission rate and/or concentration of these pollutants and for determining the opacity of the exhaust gas stream.

Item A. Federal regulations state that particulate matter compliance shall be determined using 40 CFR 60, Appendix A, Method 5 with the modifications as follows: the sample size collected shall be 60 cubic feet and the maximum probe and filter holder temperature shall be no greater than 320 plus or minus 25 degrees Fahrenheit (40 CFR 60.58a(b)(3)). The rule proposes to adopt the enlarged sample size for waste combustor classifications I, II, A, B, and C and proposes a sample size of 30 cubic feet for waste combustor classifications III, IV, and D. Since Class I, II, A, B, and C waste combustors have lower particulate matter emission limits, a larger sample is necessary to measure the particulate matter concentration at the emission limit. The proposed rule also specifies that the particulate matter concentration be reported as corrected to 7 percent oxygen. It is reasonable to require this since the emission limits are specified as concentrations corrected to seven percent oxygen. The emission limits require the contaminant concentrations to be corrected to a specific oxygen concentration to compensate for any possible dilution of the exhaust gasses.

Currently, existing Minn. Rules pt . 7011.0725 regulates the method of collecting test samples for particulate matter compliance determination tests. Part 7011.0725 modifies 40 CFR 60 Appendix A, Method 5 by prescribing an analysis method to measure condensable organic contaminants which would otherwise not be accounted as particulate matter with the federal method 5. These organics condense in the ambient air where they form PM10, a regulated pollutant for which ambient air quality standards apply (40 CFR 50.6).

Subitems 1 and 2. Subitems 1 and 2 define the terms "front-half" and "total" particulate matter. "Front-half" particulate matter is that which is measured using the method mandated by EPA; 40 CFR 60, Appendix A, Method 5. "Total" particulate matter is that which is measured using the method set forth in Minn. Rules, pt. 7011.0725. The proposed rule establishes a dual particulate matter emission limit for waste combustor classes, A, B, and I. One limit for the front-half particulate matter and one for the "total" particulate matter. Since both methods are required to determine compliance with the proposed standards of performance, it is reasonable to define them in the proposed rules. See the Technical Work Paper entitled "Performance of APCD at Municipal Waste Combustors" for a discussion of the inclusion of the condensable organic emissions as particulate matter from waste combustors.

Item A also adopts the federal requirements set forth in 40 CFR 60.58a(b)(4) (i), (ii), and (iii). This item requires that for each Method 5 run, the emission rate shall also be determined using oxygen or carbon dioxide measurements, dry basis F factor and dry basis emission rate calculation procedures in 40 CFR 60 Appendix A, Method 19. These calculations determine an emission rate from the measured concentrations and are required for major sources in attainment areas for the federal prevention of significant deterioration permitting program (40 CFR 60.24(b)(1). The F factor calculated during the testing would be used as the basis for calculating emissions in the event of failure of the CEMS as required under part 7011.1260, subp. 5, item D.

Item B. Item B adopts the federal requirements set forth in 40 CFR 60.58a(e) (1), (2), (4), and (5). Item B establishes the test method for determining compliance with the sulfur dioxide emission limits. Compliance with the sulfur dioxide emission limit shall be determined with a continuous emission monitor.

Item C. Item C adopts the federal requirements set forth in 40 CFR 60.58a(g) (2), (3), and (4). Item C establishes the test method for determining compliance with the nitrogen oxides emission limits. Compliance with the nitrogen oxides emission limit shall be determined with a continuous emission monitor.

Item D. Item D adopts the federal requirements set forth in 40 CFR 60.58a(b) (7). Item D establishes the test method for determining compliance with the exhaust gas opacity limit. Compliance with the exhaust gas opacity limit shall be determined by a qualified observer using 40 CFR 60 Appendix A, Method 9.

Item E. Item E proposes stack testing for determining the compliance status of a Class IV waste combustor with the carbon monoxide emission limit. Federal regulations require Classes I, A and B waste combustors to demonstrate compliance with the CO emission limit using continuous emission monitoring. The proposed rule also requires this of Classes II, III, C and D.

Because CO emissions are highly variable and are a good indicator of the combustion conditions, continuous monitoring is preferred over stack testing for compliance determination.

Minn. Stat. § 14.115 (1990) requires the MPCA to consider methods to reduce the impact of the proposed rule on small business. CO monitors cost approximately $35,000 to purchase and install properly (Ref. 180). The annual operating cost of a CO monitor is approximately $12,000. These costs are as high as 38 and 24 percent of the capital and annual operating costs of a Class IV waste combustor respectively (Exhibit 3 pp. 119). Alternatively, continuous temperature monitoring in the combustion chamber has a capital cost of about $5,000.00, much lower operating cost, and is a good indicator of combustion conditions (as is a CO continuous monitor). Combustion chamber temperature monitoring is also required in the proposed part 7011.1260, subp. 1. Further, Class IV waste combustor units operate for far fewer hours than the other classes of waste combustors; less than 2,000 hr/yr vs 6,500 to 7,000 hr/yr for municipal waste combustors. Stack testing and combustion chamber temperature continuous monitors is a reasonable alternative to continuous carbon monoxide emission monitoring given the financial burden carbon monoxide continuous monitoring would place upon the owner and operator of a Class IV waste combustor.

c. **Subpart 3. Performance Test Methods for Other Air Contaminants.** This subpart specifies the test methods for determining the emission concentration of non-criteria pollutants for which there is an emission limit.

The proposed rule provides that compliance with the emission limits for these contaminants may be determined by other equivalent methods that have been approved by the commissioner. For contaminants such as mercury for which the control and emission measurement technologies are relatively new, it is reasonable to allow for the fact that other methods may provide equivalent or better emission measurement results. For this reason, it is reasonable to propose the flexibility of using methods other than those set forth in the proposed rule to determine the emissions of non-criteria contaminants.

Item A. Item A adopts the federal requirements set forth in 40 CFR 60.58a(f)(1) and (2). Item A establishes the test method for determining compliance with the hydrogen chloride emission limit and the method to be used for calculating the percent reduction in HCl emissions. As required by the federal regulations, compliance with the HCl emission limit shall be determined using 40 CFR 60 Appendix A, Method 26.

Item B. Item B adopts the federal requirements set forth in 40 CFR 60.58a(d)(1). Item B establishes the test method for determining compliance with the polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF) emission limit and the length of the sampling time. For Classes I, II, A, and B the proposed rule adopts the federally specified sampling period of four hours. As is required by the federal regulations, compliance with the PCDD/PCDF emission limit shall be determined using 40 CFR 60 Appendix A, Method 23.

Since the PCDD/PCDF emission limits for waste combustor Classes III, C, and D are higher than those for Classes I, II, A, and B, a smaller sample is required to achieve the detection limits of Method 23. This smaller sample can be collected more quickly than the sample required for large municipal waste combustors. A shorter sampling period can thus be specified. The cost of conducting compliance tests is strongly influenced by the amount of time a sampling crew is at the facility site. Since an adequate sample can be collected in three hours, this sampling period is specified.

For these reasons it is reasonable to specify a 4 hour sampling period for waste combustor Classes I, II, A, and B and a 3 hour sampling period for Classes III, C, and D.

Item C. Item C establishes the test method for measuring metals emissions. This item also describes how compliance with mercury emission limit will be determined. Currently, the federal regulations do not establish requirements for determining mercury emissions from waste combustors. EPA is mandated by the Clean Air Act Amendments of 1990 to promulgate these requirements in the near future.

Currently, two methods have been used for sampling mercury emissions: Method 101A and Draft Method 0012, also referred to as "Modified Method 5 Multi-Metals", "Method 29" or "4M5." Method 101A was developed to test mercury emissions from sewage sludge incinerators. This multi-metals test method was developed for use at hazardous waste incinerators to measure metals emissions (40 CFR 266, Appendix IX, section 3.1). EPA is expected to promulgate Method 29 in 40 CFR Part 60 Appendix A as the method for determining mercury emissions when it reproposes MWC MACT standards.

Due to better precision and higher average mercury concentration measurements, Method 29 is preferred over Method 101A (Exhibit 1 pp. 4-11). Item C of this subpart of the proposed rule specifies Method 29 as the method for measuring metals emissions and determining compliance with the mercury emission limit.

Item C limits the size of the sample that can be collected for each mercury emissions test run. In order to maintain the accuracy of the sampling, a minimum sample volume of 1.7 cubic meters (60 cubic feet) and a maximum sample collection period of two hours has been specified for each test run. Specifying the sample volume ensures that very low emissions are still collected and measurable. Specifying the maximum sample period ensures that sources that have potentially high mercury emissions will not exhaust the collection capacity of the sample train, thereby making the sampling invalid.

Item C also states that to determine compliance with the removal efficiency requirements, concurrent sampling at the air pollution control device's inlet and outlet is necessary. Since mercury emissions are variable, the inlet concentrations that correspond to outlet concentrations must be measured.

This item also explains that RDF facilities may choose to conduct mercury emissions testing either every 90 days or 15 months. This provision is allowed in Minn. Stat. 116.85, subd. 1. Item C explains which requirements apply to which testing schedule.

Subitem (1). Subitem (1) describes the procedures to determine compliance with the short-term mercury emission limits. Subitem (1)(a) states that the facility is in compliance if the arithemetic average of three or more samples is less than the applicable limit. The development of the emission limit was based on the average of three emission sampling runs. Since the emission limit was developed under this condition, it is reasonable to conduct compliance testing under the same conditions.

Subitem (1)(b) requires that the average of each removal efficiency be determined, if the facility's emissions did not comply with the mercury concentration limit and the facility conducted concurrent inlet and outlet mercury emissions testing. Subitem (1)(c) then states that if this average removal efficiency is greater than or equal to 85 percent, the facility is in compliance. Since the emission limit was developed based on the average of each sampling run's removal efficiency, it is reasonable to determine compliance in the same manner.

Subitem (2). Subitem (2) establishes procedures for determining compliance with the long-term emission limits. Subitem (2)(a) states that compliance with the mercury emission limit will be determine by the arithmetic average of all emission concentrations available from the previous calendar year (a "rolling" average).

As specified in proposed part 7011.1270 (performance test frequency), mercury emissions testing must be conducted every 90 days for those facilities (except facilities burning RDF) with mercury limits. A waste combustor with mercury emission limits will at a minimum have four testing events, each containing at least three samples for a minimum of 12 samples. The long-term emission limit for mercury was developed based on a facility having 12 samples (three runs four times each year) from which to determine an average emissions concentration. Because the long-term emission limit was developed to reflect an annual emissions rate, it is reasonable to use data collected during the previous year.

There are several ways of applying an annual limit. A full "fixed" year's worth of data may be used, or the average can be a "rolling" average. With the former, all emission results collected from day 1 to day 365 are averaged together. Each following year, the previous year's data is put aside, and another year's worth of data is collected. Compliance with this type of limit requires waiting until the entire year's testing has been completed.

With the rolling-average, during the first year, all emission results collected from day 1 to day 365 are averaged to determine that year's emissions. With the next test, the emissions test results that are older than 365 days are eliminated from the data set, and the new emissions test results are included. Compliance can be determined every time a test is conducted.

Subitem (2)(b) requires that the average of each removal efficiency be determined, if the facility's emissions did not comply with the mercury concentration limit and the facility conducted concurrent inlet and outlet mercury emissions testing. Subitem (2)(b) then states that if this average is greater than or equal to 85 percent, the facility is in compliance. Since the emission limit was developed based on the average of each sampling run's removal efficiency, it is reasonable to determine compliance in the same manner.

Subitem (3). Subitem (3) specifies how RDF facilities that conduct testing every 15 months determine compliance with the proposed emission limit. Subitem (3)(a) states that these facilities have a single standard to be complied with (the long-term limit is also the short-term limit). Since the emission limit was based on what an RDF facility can achieve when the minimum of three sampling runs are taken, it is reasonable that the method of determining compliance with the standard is the same.

Subitem (3)(b) states that if an owner or operator chooses to demonstrate compliance with the minimum removal efficiency requirement for mercury, sampling must be conducted concurrently at the inlet and outlet of the air pollution control equipment and that a removal efficiency of at least 85 percent must be demonstrated. Since the emission limit was developed based on the average of each sampling run's removal efficiency, it is reasonable to determine compliance in the same manner.

d. Subpart 4. Steam Flow Measurement Method. Subpart 4 adopts the federal requirements set forth in 40 CFR 60.58a(h)(ii). This subpart establishes the method for determining the steam flow rate and specifies the procedure to be followed when designing, constructing, installing and calibrating the equipment for this purpose. To maintain consistency with the federal regulations, it is reasonable to adopt these requirements.

e. Subpart 5. Performance Tests Required. Subpart 5 establishes the list of contaminants for which performance tests are required. Lead and cadmium are included because EPA is mandated under the Clean Air Act Amendments of 1990 to promulgate regulations for these two air contaminants. It is planned that the federal regulations will first affect large and very large municipal waste combustors. Regulations for small municipal waste combustors will follow some time later. It is impossible to estimate when federal regulations for these air contaminants will be proposed or promulgated for Class III, IV, and D waste combustors. When federal regulations are promulgated, this rule will be amended to adopt emission guidelines as necessary. In the meantime, more information is required from waste combustors regarding their lead and cadmium emissions. All data collected by standardized method is useful for the process of establishing emission limits. For these reasons, it is reasonable to require owners and operators of waste combustors to test for these air contaminants.

Item D. Minn. Stat. § 116.07, subd. 4 gives the MPCA the authority to establish emission limits in a facility's air emission permit and to require testing to determine the compliance status of the facility. It is reasonable to require waste combustor owners and operators to test for other contaminants for which limits are established in their permits.

f. Subpart 6. Operation During Performance Testing. Subpart 6 proposes the requirement that the owner or operator shall report the conditions under which the waste combustor was operated during performance tests. This requirement is proposed to ensure that the conditions under which the waste combustor is operated during performance testing are representative of the conditions under which it will normally be operated. It is reasonable to require that the conditions under which a waste combustor is tested and operated are the same.

g. **Subpart 7. Maximum Demonstrated Capacity.** For waste combustor Classes I, II, III, A, B, C, and D Subpart 7 adopts the federal requirement set forth in 40 CFR 60.58a(h) and establishes that a waste combustor's maximum demonstrated capacity shall be determined during the initial performance test and each subsequent test for which compliance with the PCDD/PCDF emission limit is demonstrated. The federal requirements apply to Classes I, A, and B and have been extended to Classes II, III, C, and D. Since the reason for defining the term "maximum demonstrated capacity" is ultimately to control PCDD/PCDF emissions, it is reasonable to base the determination of the maximum demonstrated capacity on measured PCDD/PCDF emissions. Since PCDD/PCDF emission limits have been established for waste combustor Classes II, III, and C, it is reasonable to extend the method of determining the "maximum demonstrated capacity" to Classes II, III, C, and D.

To minimize dioxin emissions, maximum destruction of organics in the combustion chamber and minimum formation of organics downstream of the combustion chamber need to be addressed. Waste combustor load affects both of these mechanisms.

One factor in the destruction of organics in the combustion chamber is the residence time of the flue gases at a temperature sufficient to destroy them. If the flue gas flow rate is excessive, the residence time of the gases at temperature is too short to ensure destruction.

One factor in the minimization of dioxin formation down stream of the combustion chamber is the minimization of the particulate matter entrained in the flue gases. Since particles in the flue gases act as sites for the formation of the organics, organic formation can be minimized by minimizing the number of particles in the flue gases. Therefore, it is desirable to minimize the entrainment of particulate matter in the flue gases (particulate matter carryover) (Ref. 181).

Waste combustor heat load has been shown to affect particulate matter carryover (excessive heat load increases particulate matter carryover) and the flue gas flow rate. Therefore, through both of these mechanisms (particulate matter carryover and flue gas flow rate), waste combustor load affects organic emissions. The objective of measuring and regulating the operating load is to ensure that a waste combustor is operated within the envelope in which it was demonstrated, during stack testing, to comply with the dioxin/furan emission limits.

Since the purpose for regulating the waste combustor's operating load is to minimize organic emissions, it is reasonable to base the determination of a waste combustor's maximum demonstrated capacity on the load level at which a waste combustor was operated while demonstrating compliance with the organics emission limit. Since wastes and operating conditions can change over time, it is reasonable to require the owner or operator to redetermine the maximum demonstrated capacity whenever organic emission compliance testing is conducted.

For Class IV waste combustors, it is proposed that the maximum demonstrated capacity shall be determined during performance testing for which compliance with the carbon monoxide and particulate matter emission limits is demonstrated.

Minn. Stat. § 16.85, subd. 1 requires that for any permitted incinerator for which the air emissions permit contains emission limits for dioxins, the owner or operator must install a continuous emissions monitoring system acceptable to the commissioner to ensure optimum combustion efficiency for the purpose of optimum dioxin destruction. Class IV waste combustors that are not operated to recover metals will not be required to obtain a permit.

The capital costs for the CO monitoring equipment alone could approximately equal 2/3 of the cost of the waste combustor. Operating costs for the CO monitor are also significant and would drastically increase the cost of waste disposal. For this reason, no dioxin emission limit was proposed for Class IV waste combustors and no dioxin emission testing is required. Therefore, the maximum demonstrated capacity must be determined in conjunction with another emission limit for which a correlation with PCDD/PCDF emission has been found.

The proposed rule (for all waste combustors) relies on good combustion practice to minimize the emission of organic contaminants. For Class IV waste combustors, the particulate matter carryover control aspects of good combustion practices are applied to minimize PCDD/PCDF emissions. Particulate matter carryover can act as sites for the formation of dioxins downstream of the combustion chamber; therefore, by controlling particulate matter carryover, dioxin formation and emission can be controlled.

For Class IV waste combustors which typically do not have post-combustion particulate matter control devices, the only way to comply with the particulate matter emission limit is by controlling particulate matter carryover. The amount of carryover is a function of the design of the combustion system and the combustor load. The proposed PM emission limit for Class IV waste combustors is such that PM carryover must be well-controlled in order to comply with the emissions limit.

Carbon monoxide is one of many products of incomplete combustion (PIC) found in a waste combustor's exhaust gases, as is PCDD/PCDF. A general correlation has been found between carbon monoxide and PCDD/PCDF emissions. Therefore, carbon monoxide emissions can be used as an indicator of products of incomplete combustion emissions and may broadly indicate dioxin emissions (Ref. 182). The CO emission limit thus acts as a surrogate dioxin emission limit.

For these reasons, it is reasonable to base the determination of the maximum demonstrated capacity for a Class IV waste combustor on the load level at which a waste combustor was operated while demonstrating compliance with the particulate matter and carbon monoxide emission limits.

h. **Subpart 8. Particulate Matter Control Device Temperature.** Subpart 8 adopts the federal requirements set forth in 40 CFR 60.58a(h)(9). Subpart 8 requires the owner or operator of a waste combustor with post-combustion particulate matter control to determine and record the temporal average gas stream temperature at the inlet to the most efficient particulate matter control device. To impede the formation of organics in the particulate matter control device, federal regulations and the proposed rule require the waste combustor to be operated in such a manner that the inlet gas temperature is less than 30 degrees Fahrenheit above the average temperature recorded during compliance demonstration testing. The operating temperature limitation is established to keep the PM control device temperature out of the range in which dioxin formation can significantly increase. Initially, EPA considered establishing a maximum inlet temperature of 450 degrees Fahrenheit. However, it was discovered that a PM control device could be operated in compliance with the temperature requirement and still not comply with the dioxin emission limit. In addition, some facilities will be quite capable of complying with the dioxin emission limit at PM control devise operating temperatures above 450° F (Ref. 183). To maintain consistency with the federal regulations and to ensure continued compliance with the dioxin emission limit, it is reasonable to require the owner or operator to determine and record the particulate matter control device inlet gas temperature that was demonstrated by compliance testing to achieve the dioxin emission limit.

i. **Subpart 9. Mercury Removal equipment Operation.** Subpart 9 proposes the requirement that the owner or operator shall determine and record the average additive feedrate during testing to demonstrate compliance with the mercury emission limit. It is reasonable to require a waste combustor to be operated in the same manner in that it was during testing in which compliance with the standards of performance was demonstrated. It is also reasonable to require the owner or operator to determine and record the average additive feedrate used during compliance testing.

j. **Subpart 10. Solid Waste Composition.** Subpart 10 proposes the requirement that the owner or operator shall conduct waste composition studies as described in the proposed rule.

Knowledge of the wastes combusted is vital to the application of good combustion practices and the minimization of organic emissions. With better knowledge of the waste stream, including heat content and identification of potential problem materials, good combustion practices can be more consistently achieved. Knowledge of the heat and moisture contents of the waste is especially important for waste combustors that do not generate steam from the waste heat (typical of Class IV waste combustors) and therefore have no way of knowing how much heat is being released from the combustion process at any particular time. This increases the possibility of drastically inconsistent operation of the waste combustor, and the possibility of significantly increased emissions. By mixing high heat value waste with low heat value waste, overloading and underloading the combustor can be avoided. Better knowledge of the waste stream also improves the likelihood of problem materials being removed from the waste stream before combustion. For this reason, the proposed rule requires composition studies and sets forth the procedure and schedule for conducting these studies. Since waste composition can change over time, it is reasonable to require that a study is conducted periodically.

k. Subpart 11. Subpart 11 establishes the operating requirements that an owner or operator of a waste combustor must comply with in the event of a stack test exceedance of an emission limit. Subpart 11 adopts the requirement set forth in Minn. Stat. §116.85. Minn. Stat. § 116.85, subds. 2 and 3 provide as follows:

> **Subd. 3. Periodically tested emissions.** Should, at any time after normal start-up, the permitted facility's periodically tested emissions exceed permit requirements based on accurate and valid emissions data, the facility shall immediately report the exceedance to the commissioner, and the commissioner shall direct the facility to commence appropriate modifications to the facility to ensure its ability to meet permitted requirements within 30 days, or to commence appropriate testing for a maximum of 30 days to ensure compliance with applicable permit limits. If the commissioner determines that compliance has not been achieved after 30 days, then the facility shall shut down until compliance with permit requirements is demonstrated based on additional testing. (Minn. Stat. § 116.85 subds. 2, 3 (1990))

The intent of this statute, and this subpart of the proposed rule, is to require waste combustors to shut down if repairs or modification required to return a facility to compliance cannot be completed within 30 days.

The MPCA proposes to establish a procedure for reporting exceedances. By establishing a procedure, the waste combustor facility owners or operators will have a consistent method for reporting and will be assured of complying with Minnesota Statutes. Since the consequences of exceedances are so severe, i.e., shut down the facility, there is a disincentive to report exceedances. By establishing a procedure, sources will be unable to make the claim that the requirements for reporting exceedances were vague or unknown, therefore, the owner or operator will be less likely to fail to report an exceedance.

Item A. Item A requires the owner or operator to report to the commissioner as soon as possible after an exceedance has been determined.

Item B. Item B requires the owner or operator to commence repairs or modifications within 30 days of he report of the exceedance or commence performance testing for a maximum of 30 days to demonstrate compliance. Thirty days of testing are allowed to demonstrate that an exceedance was the result of an anomaly in the waste stream (for example, a mercury limit exceedance caused by a mercury source that went unnoticed in the waste stream) and was not the result of malfunctioning equipment. It is reasonable to provide this opportunity to demonstrate that there was no equipment malfunction.

Item C. Item C requires the owner or operator to shut down the waste combustor if it cannot be returned to compliance within 30 days or if the required repairs or modifications require an amendment to the facility's permit as required in Minn. Stat. § 116.85 subd. 3.

Item D. Item D requires the owner or operator to demonstrate compliance upon completion of the repairs or modifications. Compliance is to be determined by testing. The owner or operator is required to notify the commissioner ten days in advance of the date on which compliance testing is to be commenced. This provides the MPCA sufficient time to provide an enforcement person to witness the testing. The notification shall also provide the commissioner with the start-up date.

16. Reasonableness of Part 7011.1270--Performance Test and Ash Sampling Frequency

The following addresses the reasonableness of the proposed performance test and ash sampling schedule. Performance testing is required under the promulgated federal regulations for municipal waste combustors (40 CFR 60.58a and 60.8). In the following discussion where federal regulations are cited, the citation generally applies only to waste combustor Classes I, A, and B. These are the classes for which federal regulations have been promulgated. In the proposed rule, many of the federal requirements have simply been extended to include some or all of the remaining classifications (II, III, IV, C, and D). The following includes a discussion of the reasonableness of this extension. It is reasonable to require compliance demonstration based on an established schedule for performance testing and ash sampling for all classes of waste combustors.

Performance testing for mercury emissions is required for municipal waste combustors under Minnesota Statutes, section 116.85. To comply with this statute, mercury testing specifications have been included in the proposed rule. Minnesota Rules, Part 7035.2910 sets forth which tests and the frequency of testing for municipal waste combustors must be conducted (waste combustor classifications A, B, C, I, and II). Ash testing requirements for Classes III, IV and D are proposed in this rule. Waste combustor air emission permit requirements, as proposed in this rule (part 7011.0801), state that the permit must contain provisions for ash testing. Those provisions are specified here since the solid waste rules are silent.

Item A. This item proposes the schedule for performance testing for waste combustor Classes I, A, and B.

Subitem 1. This subitem proposes that the performance tests shall be conducted once within the normal start-up period. The normal start-up period is defined as the period of time between when waste is initially burned in the waste combustor and a maximum of 180 days after that date. This is an adoption of the federal requirements set forth in the general requirements of 40 CFR 60.8.

Subitem 2. This subitem proposes that the performance tests shall be conducted annually and within 12 months of the initial performance tests required in subitem 1. This is an adoption of the federal requirements set forth in 40 CFR 60.58a.

Subitem 3. This subitem proposes that the performance tests for mercury emissions shall be conducted every 90 days for mass burn waste combustors and every 15 months for waste combustors burning RDF. This subitem also proposes that if an exceedance of the mercury emission limit occurs at a waste combustor burning RDF, the test schedule shall then become every 90 days. This is an adoption of the requirements set forth in Minnesota Statutes, section 116.85.

Item B. This item proposes the schedule for performance testing and waste composition analysis for waste combustor Classes II and C.

Subitem 1. This subitem proposes that the performance tests shall be conducted once within the normal start-up period. The normal start-up period is defined as the period of time between when waste is initially burned in the waste combustor and a maximum of 180 days after that date. This is an adoption of the federal requirements set forth in 40 CFR 60.8. Paragraph 40 CFR 60.8 is found in 40 CFR 60, Subpart A (General Provisions).

These waste combustors are not regulated under the promulgated federal regulations for municipal waste combustors (40 CFR Part 60, Subparts Ea and Ca). If they were constructed after August 17, 1971 and combust more than 50 tons per day in each unit, they are regulated under 40 CFR, Part 60, Subpart E. All Class C facilities in Minnesota were constructed after 1971 and therefore are subject to the requirements of Subpart E. Therefore, all of these facilities are also subject to the requirements set forth in 40 CFR 60.8 (Standards of Performance for New Stationary Sources, Performance Tests).

Subitem 2. This subitem proposes that the performance tests shall be conducted within 12 months of the initial performance tests required in subitem 1 and annually for a minimum of three years. If the three tests demonstrate compliance with the particulate matter and dioxin emission limits, the owner or operator may choose to conduct the performance tests every two and one-half years (with the exception of the mercury testing which is required by Minnesota statute). At a minimum, a performance test for PM and dioxin emissions shall be conducted every two and one-half years, but no more than 30 months following the previous test. If a test fails to demonstrate compliance, the testing schedule shall revert back to annual testing.

With the exception of the time frame being shortened to better fit the five year permitting schedule for waste combustors (the maximum time between tests is 30 months versus 36 months), this schedule is a simplified versus of the schedule that was proposed by US EPA in Federal Register, Vol. 54, No 243, 52297. The promulgated requirements for waste combustor Classes A, B, and I, as described above, do not provide the owners or operators the opportunity to forego performance testing. When the federal requirements for waste combustor Classes II and C are promulgated it is probable that the schedule proposed in this rule will allow less frequent testing similar to what is proposed in this rule.

Less frequent testing for these waste combustors does not mean that the combustors go unmonitored. Continuous operation monitoring and quarterly reporting of operations is required, and mercury testing is required every 90 days or 15 months. Since these combustors are much smaller than Classes A, B, and I waste combustors, the cost to test is a much larger portion of the operating costs and could significantly increase the cost of waste disposal at these combustors. For these reasons, it is reasonable to adopt the test schedule as presented, which requires less frequent testing for Class II and C waste combustors.

Subitem 3. This subitem proposes that the performance tests for mercury emissions shall be conducted every 90 days for mass burn waste combustors and every 15 months for waste combustors burning RDF. This subitem also proposes that if an exceedance of the mercury emission limit occurs at a waste combustor burning RDF, the test schedule shall then become every 90 days. This is an adoption of the requirements set forth in Minnesota Statutes, section 116.85.

Item C. This item proposes the schedule for performance testing and ash testing for Class III and D waste combustors.

Subitem 1. This subitem proposes that the performance tests shall be conducted once within the normal start-up period. The normal start-up period is defined as the period of time between when waste is initially burned in the waste combustor and a maximum of 180 days after that date. This is an extension of the federal requirements set forth in 40 CFR 60.8 to Class III and D (industrial) waste combustors. Since waste combustors can be significant sources of pollution, it is reasonable to require a facility to demonstrate compliance with the applicable standards within a short period of time after initial start-up. It is also reasonable to allow a period of time for "shake down" of a new waste combustor. Six months is a reasonable amount of time for "shake down" while not being an excessively long period.

Subitem 2. This subitem proposes that the performance tests shall be conducted every two and one-half years and within 30 months of the initial performance tests required in subitem 1. This is the same frequency as required of waste combustor Classes II and C. The owners and operators of Class III and D waste combustors are not required to test annually for the first three years. Because these waste combustors are much smaller than those discussed previously (and the potential impact from these facilities is correspondingly smaller), it is reasonable to require less testing. Testing every 30 months will provide two sets of data during the five year life of the waste combustors air emissions permit. This will provide better information for review during the permit renewal process than would be provided by a longer testing interval while reducing the cost when compared to the testing costs for municipal waste combustors.

Subitem 3. This subitem proposes that for Class III waste combustors, the performance tests for mercury emissions shall be conducted every 90 days. This is an adoption of the requirements set forth in Minnesota Statutes, section 116.85. Minnesota Statutes, section 116.85 applies to any incinerator for which there is a mercury emission limit in the permit. Since these waste combustors are typically used at large industrial or medical facilities, and therefore burn a waste other than RDF, the testing frequency is every 90 days.

This subitem also proposes that for Class D waste combustors, the performance tests for mercury shall be conducted every two and one-half years. This will allow the MPCA to monitor mercury reduction efforts. Periodic mercury emissions testing will help determine whether these facilities will comply with future, and yet unknown, federal mercury emission limits required by the CAA (Clean Air Act, Sec. 129 (a)(1)(D)). Therefore, it is reasonable to require mercury testing for Class D waste combustors every 2 and one-half years.

Subitem 4. This subitem proposes that ash from Class III and D waste combustors shall be tested every 30 months for leachable metals. The list of metals contains the eight RCRA metals plus nickel. The eight RCRA metals listed are those for which a waste is to be tested to determine if it is to be handled as a hazardous waste. Nickel is added to the list because it is a potential carcinogen. Only MSW combustors are subject to the Minnesota Rules, Part 7035.2910, "Municipal Waste Combustor Ash Testing Requirements." In the absence of this rule, ash from waste combustor Classes III, IV and D must be evaluated in accordance with Minnesota Rules, part 7045.0214 to determine if it must be handled as a hazardous waste like any industrial waste generated in Minnesota. The proposed rule requires that the ash from Class III and IV waste combustors to be tested to determine its metals leaching characteristics.

Currently, the responsibility to test Class III and D waste combustor ash rests with the landfill that accepts the ash. The criteria for accepting the ash and the frequency of testing is to be determined by each facility as part of the landfills industrial waste management plan. This results in inconsistent testing between landfills. The proposed rule will probably result in increased and uniform testing of the ash from Class III and D waste combustors. For this reason, it is reasonable to require less frequent ash testing for Class III and D waste combustors than for municipal waste combustors (every 30 months versus every 90 days).

Item D. This item proposes the schedule for performance testing and ash testing for Class IV waste combustors.

Subitem 1. This subitem proposes that the performance tests shall be conducted once within the normal start-up period. The normal start-up period is defined in federal regulations as the period of time between when waste is initially burned in the waste combustor and a maximum of 180 days after that date. This is an extension to Class IV waste combustors of the federal requirements set forth in 40 CFR 60.8. Since waste combustors can be significant sources of pollution, it is reasonable to require a facility to demonstrate compliance with the applicable standards within a short period of time after initial start-up. It is also reasonable to allow a period of time for "shake down" of a new waste combustor. Six months is a reasonable amount of time for "shake down" while not being an excessively long period.

Subitem 2. This subitem proposes that the performance tests shall be conducted every five years and within 60 months of the initial performance tests required in subitem 1. The MPCA is directed to reduce the financial burden of rules on small business where possible. One method to do this is to reduce the testing frequency requirement. Since most facilities with Class IV waste combustor are either rural hospitals or small metal recovery companies, it is reasonable to reduce the testing frequency to once during the life of the air emissions permit after initial testing to reduce the cost to the owner or operator.

Subitem 3. This subitem proposes that ash from Class IV waste combustors shall be tested every 60 months for leachable metals.

As with Class III and D waste combustor ash, the responsibility to test Class IV waste combustor ash rests with the landfill that accepts the ash. The criteria for accepting the ash and the frequency of testing is to be determined by each facility as part of the landfills industrial waste management plan. This results in inconsistent testing between landfills. The proposed rule will probably result in increased and uniform testing of the ash from Class IV waste combustors. Also, evidence indicates that Class IV hospital waste combustor ash typically tests non hazardous (Ref. 184).(MPCA, 1991 page 64). For this reason, it is reasonable to require less frequent ash testing for Class IV waste combustors than for municipal waste combustors (every 60 months versus every 90 days).

17. Reasonableness of Part 7011.1275--Personnel Training

The following addresses the reasonableness of the proposed personnel training requirements. Personnel training requirements are a part of the federal requirements for municipal waste combustors (40 CFR 60.56a). In order for the proposed rule to be included in the SIP, it must incorporate the federal regulations or requirements that are at least as stringent. Therefore, it is necessary and reasonable to include personnel training requirements in the proposed rule. Since the federal regulations apply only to Class I, A, and B waste combustors, the federal regulations only require training of personnel at those facilities. As previously discussed in this SONAR, emissions at facilities are controlled, at least in part, by careful operation of the combustor. Because operation of the waste combustor is an element, if not the key, to emissions control at all facilities, it is reasonable to apply the personnel training requirements to personnel at all waste combustors. Where it was practical, the proposed rule parallels the federal regulations. To ensure adequate training, where it was necessary, additional requirements have been proposed. In order to lessen the burden for small business (Class IV waste combustors) the supervised work requirement (part 7011.1275, subpart 1, item C) has been reduced for these facilities.

a. **Subpart 1. General.** This subpart requires waste combustor personnel to complete site-specific instruction, and on-the-job training, and requires the owner or operator to maintain personnel training records.

The proposed rule has adopted the federal method of waste combustor personnel training which is training based on a site-specific operating manual (40 CFR 60.56a). In addition to training based on the operating manual, MPCA has proposed to require those persons without waste combustor or boiler operation experience to complete a period of supervised on-the-job training.

Good combustion practice and generally good operating practice are required to meet the emission limits of the proposed rule. Therefore, it is necessary for the people operating waste combustors to be thoroughly familiar with these practices. Adequate training of the personnel operating waste combustors provides minimum assurance that good practices will be followed. The site-specific instruction will provide the background and theoretical information needed to apply good combustion practice in the field. On-the-job training uses the information learned and puts it into practice. Because compliance with emission limits is dependent on facility operation, it is reasonable to require on-the-job training of personnel without waste combustor or boiler operation experience.

The proposed rule requires that the training program instruct personnel relevant to the position held by an individual. The proposed rule also requires training relevant to new responsibilities prior to assumption of those responsibilities (item B of this subpart). To reduce the burden on the owner and operator of the waste combustor, it is reasonable to require personnel training only in areas in which an individual has responsibilities.

Item A. This item requires that each of the personnel listed in subpart 2 reviews the operating manual prior to assuming any job-related responsibilities affecting air emissions. Federal regulation requires review of the operating manual by personnel prior to assumption of responsibilities affecting facility operations. A distinction between affecting operations and affecting air emissions was made. While all positions at a facility affect the operation of that facility, not all positions affect the air emissions. It is reasonable to exempt the owner or operator of a waste combustor from the requirement to train personnel whose responsibilities do not affect the air emissions from that facility.

Item B. This item requires personnel who are changing positions to review the operating manual prior to assumption of new duties. To maintain the level of personnel training and operator competence, it is reasonable to require personnel to review the training manual when their position and responsibilities change.

Item C. Those personnel with no previous job experience with waste combustors or boilers are required to complete a period of work under the direct supervision of a certified operator or other facility personnel designated by a certified operator before assuming any job-related responsibilities affecting air emissions. To minimize the impact of emissions from waste combustors, it is reasonable to require training under the direct supervision of experienced waste combustor personnel.

The duration of the period of supervision was established in consultation with affected waste combustor personnel. A work group of affected facility personnel and MPCA staff met regularly to develop an operator certification program. With the assistance of this work group, some details of the training program were developed. The duration of the proposed supervision period was estimated as the time necessary to adequately prepare an inexperienced person to assume the duties of the position. The duration of the period was considered adequate without being burdensome. The proposed period of supervision for personnel without waste combustor or boiler operation experience is:

Subitem 1. For Class I, II, III, A, B, C, or D waste combustor personnel, 40 hours.

Subitem 2. For Class IV waste combustor personnel, 12 hours.

Since Class IV facilities are much smaller and the combustion cycle much shorter than larger facilities, it is reasonable to have a shorter period of supervised training.

Item D. This item adopts the federal requirement (40 CFR 60.56a (h)) and requires that the persons for whom training is required, are also required to review the operating manual annually. Since there are occasional changes to waste combustors, federal regulations, state rules and operating permits, it is reasonable to require periodic review of the operating manual. To maintain consistency with the federal requirements and minimize the impact of emissions from waste combustors, it is reasonable to require annual review of the operating manual by the persons described.

b. Subpart 2. Personnel Who Shall be Trained. This subpart adopts the list of waste combustor personnel required by federal regulation to receive training (40 CFR 60.56a (g)). The position of operator supervisor has been added to this list. To maintain consistency with the federal regulations, it is reasonable to adopt the list of personnel requiring training. It is also reasonable to add the position of operator supervisor since this is the Class IV waste combustor equivalent of a chief facility operator.

Personnel operating municipal waste combustor plants with a capacity greater than or equal to 250 tons per day are required by federal regulation to receive training. MPCA has expanded the list of facilities to which this requirement applies. The list includes all waste combustors regulated under the proposed rule (Classes I, II, III, IV, A, B, C, and D). The standards of performance for the control of dioxin emissions for all facilities are based on good combustion practices and therefore, training personnel at smaller facilities is no less important than larger facilities. Modern waste combustors are complicated facilities which must be properly operated to ensure minimum generation of air pollutants. This is important for both large and small waste combustors.

EPA has proposed, for small municipal waste combustors (Classes II and C), the same list of waste combustor personnel requiring training. These requirements are part of the standards of performance that were proposed for municipal waste combustors including small MWCs (Federal Register Vol. 54, 52297). Since EPA has proposed the same training requirements for the same waste combustor personnel for all municipal waste combustors and the proposed emission limits for all waste combustors are dependent upon adequate training, it is reasonable to require training for personnel of all waste combustors.

To maintain consistency with the federal regulations and to minimize the impact from emissions, it is reasonable to require training of all of the following waste combustor personnel:

The chief facility operator is in direct charge and control of the overall operation of the waste combustor. This position has the greatest effect on the operation of the waste combustor and its emissions and therefore, personnel in this position require training.

The shift supervisor is in direct charge and control of the waste combustor during an assigned shift. The shift supervisor will have a great effect on the operation of the waste combustor and its emissions and therefore, personnel in this position require training.

The operator supervisor at a Class IV waste combustor is the person who has direct responsibility for control of the waste combustor and is responsible for overall on-site supervision, management and performance of the facility. This position has the potential to have the greatest effect on the operation of the Class IV waste combustor and its emissions and therefore, personnel in this position require training.

Control room personnel are in control of the combustion process. They are the persons responsible for the combustion process including waste feed and combustion air control. Errors made in the control room can result in significant increases in the quantity of pollutant emitted and its human health and environmental impacts. Adequately training control room personnel reduces the possibility of such errors.

The ash handler is responsible for the removal of the ash from the waste combustor and its proper disposal. Since the ash can be hot and contain heavy metals, including mercury, and other toxic substances, it is very important for the health and safety of the ash handler and the environment that the ash is handled and disposed of properly.

The maintenance personnel are responsible for the maintenance of the equipment associated with the combustion of waste and control of emissions. Since the emission limits are based on good combustion practices and an inherent requirement of these practices is properly maintained and operating equipment, it is of vital importance that the maintenance personnel are properly trained.

The crane/load handler is responsible for the removal of prohibited wastes from the waste stream and/or the charging of wastes into the combustor. There are many materials that are prohibited from being burned in a waste combustor because they are dangerous and they may emit toxic pollutants when burned, for example, waste containing mercury. There are also wastes that are will not burn and must be removed from the waste stream, for example, engine blocks. The waste that goes into a combustor has a large effect on the impact that the emissions have on human health and the environment as well as the safe operation of the waste combustor. Therefore, personnel in this position require training.

c. **Subpart 3. Operating Manual Requirements.** This subpart describes the minimum requirements for the site-specific operating manual. Minimum operating manual requirements promote uniform training of waste combustor personnel. Therefore, it is reasonable to establish minimum requirements for the manual.

This subpart requires the development and annual updating of a site-specific operating manual. Since there are occasional changes to waste combustors, federal regulations, state rules and operating permits, it is necessary to update the manual periodically. For these reasons, it is reasonable to require development and updating of an operating manual.

The elements to be addressed in the operating manual are discussed in subitems A through O. Items A through L are required by federal regulation (40 CFR 60.56a (f)). To maintain consistency with federal regulation, it is reasonable to include these subitems in the proposed rule.

Item A. This item requires the manual to address the applicable state rule and federal regulations described in the facility's air emission permit. It is necessary for the persons responsible for the operation of the waste combustor to be familiar with the rules and regulations governing the facility. For example it is necessary for the crane/load handler to know that it is not permitted to burn yard waste at a waste combustor. To do so could result in a violation of the air emissions limits. To minimize the impact of emissions, it is reasonable to require the inclusion of applicable state and federal rules and regulations as described in the facility's permit in the operating manual.

Item B. This item requires the operating manual to address basic combustion theory as it applies to the facility's waste combustor unit. Basic combustor theory knowledge is necessary since it explains the limitations of the combustor and is a basic component of good combustion practices. Since good combustion practice is the basis for controlling dioxin emissions, it is necessary that waste combustor personnel are trained in this area. To minimize emissions, it is reasonable to require the inclusion of basic combustion theory as it applies to the facility's waste combustor in the operating manual.

Item C. This item requires the operating manual to address procedures for receiving, handling and feeding waste. Many different types of waste are received at a waste combustor, some of which require special handling, infectious waste for example. Other wastes need to be fed to the combustors in a manner that will not create a plug in the feed system. Plugs in the feed system can produce variations in the fuel feed rate which can lead to off specification conditions in the combustion chamber and therefore higher emissions. Therefore, it is necessary that waste combustor personnel are trained in this area. To minimize the impact of emissions, it is reasonable to require the inclusion of waste receiving, handling and feeding in the operating manual.

Item D. This item requires the operating manual to address waste combustor start-up, shutdown and malfunction procedures. Due to the extreme variability of emissions of waste combustors during periods of start-up, shutdown and malfunction, federal regulations and the state rules exempt facilities from the emission limits during those periods for up to three hours per occurrence. To minimize emissions during these periods, it is necessary to train waste combustor personnel in procedures to keep these periods as short as possible. To minimize emissions, it is reasonable to require the inclusion of waste combustor start-up, shutdown and malfunction procedures in the operating manual.

Item E. This item requires the operating manual to address the procedures for maintaining proper combustion air levels. The amount of combustion air and the location at which that air is introduced is a vital parameter in the waste combustor's ability to achieve and maintain compliance with emission limits. Therefore, it is necessary that waste combustor personnel are trained in this area. To minimize emissions, it is reasonable to require the inclusion of combustion air maintenance procedures in the operating manual.

Item F. This item requires the operating manual to address procedures for operating the waste combustor within the standards established in parts 7011.1201 to 7011.1285. To achieve and maintain compliance with the emission limits promulgated in the federal regulation and state rule, good combustion practice as well as other pollution control methods must be followed. Therefore, it is necessary that waste combustor personnel are trained in this area. To minimize emissions, it is reasonable to require the inclusion of procedures for operating the waste combustor within the standards in the operating manual.

Item G. This item requires the operating manual to address procedures for responding to upset or off-specification conditions. The ability to quickly and correctly respond to upset or off-specification conditions is vital to maintain compliance with emission limits. The averaging periods have been established knowing that off-specification conditions will frequently exist and an allowance has been made to give the waste combustor personnel time to correct the situation. However, the averaging times have been established so that in order to avoid a violation, corrective action must be taken quickly after the upset condition has been discovered. (Ref. 185). Therefore, it is necessary that waste combustor personnel are trained in corrective actions. To minimize emissions, it is reasonable to require the inclusion of procedures for responding to upset or off-specification conditions in the operating manual.

Item H. This item requires the operating manual to address procedures to minimize particulate matter carryover. A strong correlation has been found between the amount of particulate matter carryover and dioxin formation. (Ref. 186). Therefore, to minimize the dioxin emissions, it is necessary that waste combustor personnel are trained in this area. To minimize emissions, it is reasonable to require the inclusion of procedures for the minimization of particulate matter carryover in the operating manual.

Item I. This item requires the operating manual to address procedures to monitor the degree of solid waste burnout. This procedure measures the amount of carbon in the bottom ash. The goals of waste combustion are to reduce the volume of waste that is landfilled and to recover heat from the process. An indicator of the success or failure in achieving these goals is the amount of carbon in the bottom ash. If there is a high carbon content in the ash, this indicates that more heat could be extracted from the waste and the volume could be further reduced. By monitoring the degree of solid waste burnout, the system can be adjusted to maximize the heat release and volume reduction. Therefore, it is reasonable to require the inclusion of procedures for monitoring the degree of solid waste burnout in the operating manual.

Direction was sought from the EPA on the method used to determine the degree of burnout. Several methods would be acceptable to the EPA including sampling and chemical analysis of the sample as well as visual evaluation of the waste and ash on the grates to determine the degree of burnout.[24]

Item J. This item requires the operating manual to address procedures for handling ash. Ash from the combustor can be hot, and can contain toxic substances. Therefore, it is very important that the ash is handled and disposed of properly. For this reason, it is necessary that waste combustor personnel are trained in this area. To maximize worker safety and minimize emissions, it is reasonable to require the inclusion of procedures for handling ash in the operating manual.

Item K. This item requires the operating manual to address procedures for monitoring emissions. Monitoring emissions from a waste combustor is an important method of determining the state of combustion. If the emissions are properly monitored and quick action is taken to correct the off-specification conditions, emission limit violations and significant impact to human health and the environment can be avoided. Therefore, it is necessary that waste combustor personnel are able to accurately monitor air emissions and it is necessary that they are trained in this area. To minimize the impact of emissions, it is reasonable to require the inclusion of procedures for monitoring emissions in the operating manual.

Item L. This item requires the operating manual to address procedures for reporting and record keeping. Extensive reporting requirements are written into the federal regulation and the

24 Telephone conversation between Mr. Jim Kilgroe of U.S. EPA and Mr. Michael Mondloch of the MPCA, August 1992.

proposed state rule. It is necessary that the waste combustor personnel accurately report the required information. To achieve this, it is necessary that the waste combustor personnel are trained in this area. To promote uniform reporting and record keeping, it is reasonable to require the inclusion of these procedures in the operating manual.

Item M. This item requires the operating manual to address timetables and procedures for routine inspection and maintenance of equipment affecting air emissions. Maintaining the equipment in good condition is a vital part of good combustion practices. Requiring the operating manual to address these timetables and procedures not only emphasizes the importance of good maintenance, it also improves the probability that it will be done. To minimize the impact of emissions from waste combustors, it is reasonable to require the inclusion of these timetables and procedures in the operating manual.

This subpart also requires that the manual is kept in a location that is easily accessible by the persons most likely to use it, those persons whose positions are described in subpart 2. Due to the complexity of waste combustors, there will always be information that personnel operating the combustor will not know. The operating manual should be the first reference for waste combustor personnel when looking for answers. Therefore, it is reasonable to require that the training manual is kept in an easily accessible location.

Item N. This item requires the operating manual to address procedures for activating communication and alarm systems. In an emergency, knowledge of this procedure is vital to the protection of human health, the facility, and the environment. It is reasonable to include these procedures in the manual.

Item O. This item requires the operating manual to address procedures to implement the waste combustor's industrial waste management plan. To treat the wastes safely, some may need separate storage, handling, or operating conditions of the waste combustor. It is reasonable to include these procedures in the manual.

d. Subpart 4. The proposed rule has also adopted the federal requirement to maintain a record of the identity of personnel who have completed training (40 CFR 60.59a). In addition to this, MPCA has proposed to require the owner or operator to maintain a record of the number of training hours completed. This requirement is necessary to satisfy a proposed requirement for operator certificate renewal. Operator certification and the renewal requirements are discussed under the statement of reasonableness for part 7011.1280. Requiring the maintenance of the personnel training records provides the MPCA minimum assurance that the operators have been trained to a level at which they are knowledgeable enough to safely operate the waste combustor. For these reasons, it is reasonable to require the maintenance of personnel training records.

18. Reasonableness of Part 7011.1280--Operator Certification

The following addresses the reasonableness of the proposed operator certification requirements. Operator certification requirements are part of the federal requirements for municipal waste combustors (40 CFR 60.56a). In order for the proposed rule to be included in Minnesota's SIP, it must incorporate the federal regulations. Therefore, it is necessary to include operator certification in the proposed rule. Where practical, and to maintain consistency, the proposed rule has adopted the federal certification requirements.

Since the federal regulations currently apply only to Class I, A, and B waste combustors, operator certification for only these classifications is currently required by the federal regulations. However, under the Clean Air Act requirements, all standards of performance for waste combustors developed by EPA must require personnel training (42 USC 7401, 129(a)(1), (b)(1) and (d)). EPA will establish regulations for medical waste and other solid waste combustors as the standards are developed in the future. Therefore, it is reasonable to adopt training and operator certification requirements for all waste combustors in order to meet current and future federal regulations.

Modern waste combustors are complicated facilities which must be properly operated to ensure minimum generation of air pollutants. This is important for both large and small waste combustors.

To ensure a minimum level of operator competence, it is reasonable to require that operators of all waste combustors meet minimum training and experience requirements and demonstrate competence through an examination process. It is also reasonable to require certification of operating personnel based upon completion of these minimum requirements.

Operator certification also provides the MPCA with an enforcement tool to assure adequate performance of duties by waste combustor personnel. Under the threat of sanctions, an operator is less likely to negligently or intentionally improperly operate a facility. This argument applies to all forms of license and certification in which there are provisions for sanctions.

The Minnesota Legislature delegated the training of waste combustor operators to Minnesota Job Skills Partnership. The mandate of Minnesota Job Skills Partnership is to promote economic development, build capacity into the educational infrastructure and to guard the economic interests of the persons that will take the training (i.e., good wages, advancement opportunities and equal employment opportunities). The Minnesota Job Skills Partnership formed a steering committee to advise the MPCA regarding training and certification of waste combustor personnel. The steering committee was made up of representatives from large and small facilities that combust waste, Red Wing Technical College, and MPCA representatives.

The steering committee has representatives of the waste combusting industry because they know best how waste combustors are operated and what training is required to adequately prepare a person for the job. The MPCA relied upon the input from the steering committee regarding daily operations of waste combustors and how these considerations affect personnel training and certification. The MPCA considers the industry representatives on the steering committee experts on the subject. At least one representative has obtained certification from ASME in accordance with ASME QRO-1-1989. Under the advice of the steering committee, many of the details of the proposed rule regarding operator training and certification have been established. The steering committee also assisted Red Wing Technical College in the development of the curriculum for operator certification training.

Red Wing Technical College was chosen by Minnesota Job Skills Partnership to offer the first waste combustor operator certification training course and administer the first certification examination. Red Wing Technical College is close to two waste combustors; Northern States Power Company's RDF combustor at Red Wing and the City of Red Wing's municipal waste combustor. A portion of the training will take place at one or both of these facilities.

For these reasons, it is reasonable to consider the opinion and recommendations of the committee regarding matters of operator training and certification rules and certification procedures..

a. **Subpart 1. Scope.** This subpart directs the MPCA in the issuance of certificates. The MPCA shall issue a certificate to persons upon successful completion of the requirements established in items A or B of this subpart.

Item A. Persons who have obtained American Society of Mechanical Engineers (ASME) provisional certification as described in ASME QRO-1-1989 (Exhibit 2) shall be certified as chief facility operators or shift supervisors as appropriate. The ASME certification program was established at the request of the EPA and is approved by EPA for certification of personnel in these two positions. Certification in accordance with ASME QRO-1-1989 as a chief facility operator or shift supervisor is transferable from state to state. State certification is valid only in the state in which it was issued.

Item B. Persons who have completed the coursework and passed the examination as described in subpart 3 shall be certified operators as appropriate for the coursework and examination completed.

Federal regulations require certification of each chief facility operator and shift supervisor in accordance with ASME QRO-1-1989 or an equivalent State-approved certification program. Since persons who have met the requirements set forth in item A or B of this subpart have demonstrated adequate knowledge and experience in the operation of a waste combustor, it is reasonable to certify them.

b. Subpart 2. Personnel Who Shall be Certified. This subpart specifies which facility personnel must be certified: the chief facility operator and shift supervisor. To maintain consistency with the federal regulations, it is reasonable to require that these personnel obtain certification.

In addition to the chief facility operator and shift supervisor, the operator supervisor for a Class IV waste combustor must be certified. This is the person in control of a Class IV waste combustor and may or may not be the person operating it. "Operator" and "operator supervisor" are defined and certification requirements are outlined in the proposed ASME QMO-1 "Standard for the Qualification and Certification of Medical Waste Incinerator Operators" (Exhibit 2). In the proposed Minnesota rule, the term "operator supervisor" has been defined as a supervisor of personnel operating the Class IV waste combustor who is directly responsible for overall supervision of the waste combustor and the person operating it. This reflects the common situation at facilities with a Class IV waste combustor. One person operates a waste combustor, and another person has the responsibility to ensure that the operation is proper.

The federal regulations for Class A, B and I waste combustors require only the personnel in overall charge of the waste combustor to be certified. It is reasonable then to parallel the federal requirements for Class A, B and I waste combustors and require only the persons in overall charge of a Class IV waste combustor to be certified. It is also reasonable to acknowledge that the person in overall charge of the waste combustor may also be the person operating it.

c. **Subpart 3. Requirements for Operator Certification.** This subpart sets forth the requirements to be met by persons seeking certification by the State who have not obtained certification from ASME in accordance with QRO-1-1989. For state certification, compliance with the requirements set forth in item A or B of this subpart must be demonstrated. Under the federal regulations (40 CFR 60.56a (d)), it is the option of the state to offer certification of operators independent of the certification offered by ASME. MPCA elected to offer this certification as a convenience for waste combustor personnel because ASME administers its certification examination infrequently, generally at distant locations and at considerable expense. It is reasonable to offer this certification option to waste combustor personnel in Minnesota as a matter of convenience.

Item B sets forth the requirements for certification of waste combustor operators requiring certification under federal regulations (Classes I, A and B) and by extension, operators of Class II, III, C, or D. These requirements must be equivalent to ASME QRO-1-1989. Since the operation of a Class II, III, C or D waste combustor is similar to a Class I, A, or B waste combustor, the proposed rule applies the same certification requirements. The requirements set forth in item A need not be equivalent to the federal requirements because EPA has not yet proposed standards for waste combustors of this size (Class IV).

To be certified, a person must demonstrate the skill, knowledge, and experience necessary to operate a waste combustor by meeting the criteria of item A or B of this subpart.

Item A. Class IV operator certification requirements. Class IV waste combustors are operated differently from larger waste combustors. They are used more intermittently, they have simpler combustion and air pollution control and monitoring equipment. The personnel operating a Class IV waste combustor are more likely to have little experience when first hired to operate a waste combustor when compared to personnel at a larger waste combustor. The duration and emphasis of the proposed personnel training requirement is different from that for other waste combustor classifications. For Class IV waste combustor personnel, the training is based on the assumption that they have no experience operating a waste combustor or boiler. For the other waste combustor classifications, the operator certification training is based on the assumption that the person has either a boiler license or three years of experience operating a waste combustor. For these reasons, it is reasonable to have different certification requirements for Class IV waste combustor personnel.

Subitem 1. Subitem 1 requires that, in order to be a certified operator of a Class IV waste combustor, a person must hold a high school diploma or equivalent, or demonstrate five years of experience in waste combustor operation, general industry, industrial process or power plant operation. This establishes the minimum background that was recommended by the steering committee. The MPCA considers the steering committee recommendation to be reasonable.

Subitem 2. Subitem 2 requires that, in order to be certified, a person must complete at least 16 hours of training. The training course shall be one approved by the commissioner which has been designed to ensure competency to operate a Class IV waste combustor. When establishing the duration of the required training course, existing training courses were reviewed and an estimate was made of the number of hours required to adequately train persons with no previous experience. The American Hospital Association offers a one to four day training course that can be tailored to meet the requirements of any particular state authority. The material covered in the four day course (approximately 28 hours in the classroom) was considered more than necessary for the operation of a Class IV waste combustor. For example, it was considered unnecessary for an operator of a Class IV waste combustor to understand computer modeling of stack emissions or risk analysis. However, the majority of the material was considered necessary and useful. It was estimated that 16 hours would be required to adequately train Class IV waste combustor operators. The MPCA staff recommended sixteen hours of training and it was considered reasonable by the steering committee.

Subitem 3. Subitem 3 requires that, in order to be certified, a person must complete the certification process described in subpart 4 of this part. It is reasonable to withhold certification if the procedure is not completed.

Subitem 4. Subitem 4 requires that, in order to be certified, a person must pass the examination described in subpart 5 of this part. Passing an examination to demonstrate an understanding of the general operation of a waste combustor is a requirement for certification in accordance with ASME QRO-1-1989. It is reasonable to require the same demonstration of persons obtaining state certification to operate a Class IV waste combustor.

Item B. Class I, II, III, A, B, C, or D operator certification requirements. Class I, II, III, A, B, C, and D waste combustors are operated in similar manners. Therefore, operator certification and training is also similar. In accordance with the federal regulations, the certification requirements of Class I, A, and B waste combustor chief facility operator and shift supervisor must be equivalent to QRO-1-1989. The requirements set forth in subitems 1 and 2 of this item adopt the minimum experience requirement set forth in QRO-1-1989 and require additional qualifications. The additional qualifications are considered reasonable by the steering committee and the MPCA.

Consideration was given to requiring all certified operators to hold a Minnesota Department of Labor and Industry boiler license. Because not all waste combustors have boilers, it was not considered a reasonable requirement when applied to facilities without boilers for the recovery of heat. Operators of these facilities can be very experienced in waste combustor operation but have no experience with a boiler and therefore no boiler license. The proposed rule was structured to allow persons without a boiler license to obtain certification as waste combustor operators.

Consideration was also given to requiring all certified operators at a facility with a heat recovery boiler to have a Minnesota Department of Labor and Industry boiler license appropriate for the facility. However, this would have restricted movement of certified operators between facilities of different sizes. It is not the intent of the proposed rule to restrict employment opportunities. It is reasonable to establish a certification process that allows the certification of a varied group of qualified individuals and to not restrict movement of certified operators from one facility to another.

Subitem 1. This subitem describes the qualification requirements for persons who possess a Minnesota Department of Labor and Industry boiler license of at least second class engineer, Grade B. Second class engineer, Grade B licensure allows the operation of boilers and their appurtenances of not more than 100 horsepower, or to operate as a shift engineer in a plant of not more than 300 horsepower, or to assist the shift engineer, under direct supervision, in a plant of unlimited horsepower. A person with this level of licensure only needs one year of job experience rather than the three years required of those without a boiler license. Given the fact that most of the members of the steering committee hold a boiler license, they are qualified to judge the utility of a second class, Grade B boiler license. It is reasonable to require less experience of one who holds a second class, Grade B boilers license because the license itself represents a certain level of expertise.

Subsubitem a. This subsubitem describes the additional requirements that a person holding a Minnesota Department of Labor and Industry boiler license of at least second class engineer, Grade B must comply with in order to receive certification. The person must have one year of experience operating a Class I, II, III, A, B, C or D waste combustor or steam generation plant at the licensure level at least of second class engineer, Grade B and complete a 24 hour training course. The training course shall be one approved by the commissioner which has been designed to ensure competency to operate a Class I, II, III, A, B, C, or D waste combustor. The duration of the training course was established by estimating the amount of time necessary to adequately train a person to properly operate a waste combustor with experience at the specified boiler license level. These requirements are in addition to those required by the federal qualification regulations for a chief facility operator or shift supervisor and were considered reasonable by the steering committee. To minimize emissions, it is reasonable to require one year of experience and training.

Subsubitem b. Subsubitem b requires that, in order to be certified, a person must complete the certification process described in subpart 4 of this part. It is reasonable to withhold certification if the procedure is not completed.

Subsubitem c. Subsubitem c requires that, in order to be certified, a person must pass the examination described in subpart 5 of this part. Passing an examination to demonstrate an understanding of the general operation of a waste combustor is a requirement for certification in accordance with ASME QRO-1-1989. It is reasonable to require the same demonstration of persons obtaining state certification to operate a Class I, II, III, A, B, C, or D waste combustor.

Subitem 2. This subitem describes the qualification requirements for persons who do not possess a Minnesota Department of Labor and Industry boiler license of at least second class engineer, Grade B. Since some waste combustor facilities do not recover the heat from the combustion of waste, it is reasonable to provide a means to certify experienced waste combustor personnel who do not hold a boiler license.

Subsubitem a. This subsubitem describes the additional requirements that a person who does not hold a Minnesota Department of Labor and Industry boiler license of at least second class engineer, Grade B must comply with in order to receive certification. The person must have three years' experience operating a Class I, II, III, A, B, C, or D waste combustor or power plant operations and complete a 24 hour training course. The training course shall be one approved by the commissioner which has been designed to ensure competency to operate a Class I, II, III, A, B, C, or D waste combustor. The experience requirement and the duration of the training course were established by estimating the amount of time necessary to adequately train a person, without the specified boiler license, to properly operate a waste combustor. Holding a second class, Grade B boiler license demonstrates a certain level of competence and experience. Since the operation of a waste combustor is similar to that of a boiler, it is reasonable to require additional training and experience in lieu of that demonstration of competence and experience (the boilers license). These requirements exceed the federal qualification requirements for a chief facility operator or shift supervisor and were considered reasonable by the steering committee.

Subsubitem b. Subsubitem b requires that, in order to be certified, a person must complete the certification process described in subpart 4 of this part. It is reasonable to withhold certification if the procedure is not completed.

Subsubitem c. Subsubitem c requires that, in order to be certified, a person must pass the examination described in subpart 5 of this part. Passing an examination to demonstrate an understanding of the general operation of a waste combustor is a requirement for certification in accordance with ASME QRO-1-1989. It is reasonable to require the same demonstration of persons obtaining state certification to operate a Class I, II, III, A, B, C, or D waste combustor.

d. Subpart 4, Items A, B, and C. Certification Process. This subpart describes the certification process. The process is substantially the same as that described in Minn. Rules pt. 7048.0800.

Part 7048.0800 applies to the certification of waste disposal facility operators and inspectors. The differences between the rules are in the statement of time limits for notification of eligibility and amount of time required to review an application. Since the waste combustor certification examination is not administered by the state, the date on which the examination is administered is out of the state's control and cannot be used as a reference date the way it is in the waste disposal facility operator certification rule. Therefore, the time limits for review of the application are referenced to the date of receipt of the application. It is reasonable to adapt the waste disposal facility operator certification system for use in this proposed rule since it is currently in use, without major problems, for certifying Minnesota's wastewater treatment plant and landfill operators. Many of the facilities that will be affected by the proposed rule are familiar with the waste disposal facility operator certification system.

e. **Subpart 5. Examinations.** This Subpart describes the examination that must be passed for a person to receive certification.

Item A. This item states that the examination shall be approved by the commissioner and that the examination shall be closed book. Since the administration of the examination has been delegated, the state has given up some control over the specific content and form of the examination. Therefore, it is necessary that examination is reviewed and approved by the commissioner to ensure that passing the examination does demonstrate adequate knowledge and understanding of waste combustor operations. It is reasonable to maintain this control over the examination. A closed book examination is a requirement of both the examination administered by ASME and Minnesota's examination for waste disposal facility operator certification. (Minn. Rules pt. 7048.0900, subp. 2) Therefore, it is reasonable to have the same requirement in this proposed rule.

Item B. Item B describes the content of the examination for operators of a Class I, II, III, A, B, C, or D waste combustor. The content is substantially the same as that described in ASME QRO-1-1989. One exception is the elimination of questions regarding generator and turbine operations. Elimination of these questions is reasonable because not all facilities will have generators or turbines. Those that do have them are required by law to employ a person with the appropriate Minnesota Department of Labor and Industry boiler license to properly operate and maintain them (Minn. Stat. § 183.501) (1990). Therefore, the examination is equivalent to the examination described in ASME QRO-1-1989. To maintain consistency with the federal requirements, it is reasonable to adopt the examination required for federal certification.

Item C. Item C describes the content of the examination for operators of a Class IV waste combustor. The content emphasizes the skills and knowledge required of a Class IV waste combustor operator and tests the operator on the material taught in the Class IV operator certification training. This examination is not required to be equivalent to the one administered by ASME. Since

Class IV waste combustors are designed and operated differently from the larger classifications, it is reasonable to have a different certification examination.

Item D. Item D adopts the minimum grade requirement established by Minn. Rules pt. 7048.0900 subp. 3 for waste disposal facility operator certification. The minimum passing grade is a score of 70 percent. To be consistent with certification tests already administered, it is reasonable to adopt this passing grade requirement.

Item E. Item E allows a person who has failed the examination to retake the examination when it is next offered by an institution approved by the commissioner. This adopts the provision set forth in ASME QRO-1-1989. To maintain consistency with the federal regulations, it is reasonable to adopt this provision.

f. **Subpart 6. Certificates.** This subpart directs the institute administering the examination to inform the commissioner of the identity of persons who have passed the examination within ten days of completion of the examination. This is a reasonable amount of time to compile and submit the results.

This subpart states that a certificate is issued after all the conditions described in subpart 1 of this part have been met. It is reasonable to not issue a certificate if all of the conditions for certification have not been met.

This subpart also states that a certificate is valid for three years. This is adopted from Minn. Rules pt. 7048.1000 for waste disposal facility certified operators and inspectors. To maintain consistency with other Minnesota rules, it is reasonable to adopt this provision.

g. **Subpart 7. Renewal.** This subpart describes the requirements for renewal of waste combustor operator certificates. Both ASME QRO-1-1989, as adopted by the federal regulations, and the Minnesota rules for waste disposal facility certified operators have provisions for expiration and renewal of certificates. It is reasonable to provide for expiration and renewal rather than certification for life so that the commissioner can verify that training is up to date and so that the record of certified operators is limited to those actually working in the field.

Item A. The proposed rule requires application for renewal 30 days prior to certificate expiration. The proposed rule also requires the completion of additional training as a condition for renewal. Both of these requirements are conditions for renewal for waste disposal facility operator certificates. It is reasonable to require applications for renewal in advance of expiration to allow time for processing. It is reasonable to require ongoing training because waste combustor technology and regulation is a rapidly developing field.

Subitem 1. This subitem specifies the number of hours of additional training required for renewal of certificates for a certified operator of a Class I, II, III, A, B, C, or D waste combustor. The duration of the training was established by estimating the amount of time required to maintain adequate knowledge to safely operate a waste combustor. Twenty four hours of additional training over a three year period was considered to be reasonable by the steering committee the MPCA.

Subitem 2. This subitem specifies the duration of additional training required for renewal of certificates for a certified operator of a Class IV waste combustor. The duration of the training was established by estimating the amount of time required to maintain adequate knowledge to safely operate a waste combustor. Eight hours of additional training over a three year period was considered to be reasonable by the steering committee. Since Class IV waste combustors are significantly less complicated to run than larger waste combustors and the waste stream is generally more predictable and homogenous, it is reasonable to require less training for certificate renewal.

Items B and C. These items describe the requirements for reinstatement of an expired certificate. They are adopted from Minn. Rules pt. 7048.1000 subps. 7 and 8 for waste disposal facility operator certificate reinstatement. It is reasonable to adapt the waste disposal facility operator certificate renewal system for use in this proposed rule since it is currently in use without major problems and many of the facilities that will be effected by the proposed rule are familiar with the waste disposal facility operator certificate renewal system.

h. Subpart 8. List of Courses. Since additional training and commissioner approval of that training is required, it is reasonable for the commissioner to make available a list of approved courses.

i. Subpart 9. Sanctions. This subpart describes sanctions that can be taken against a certified operator and the conditions under which these sanctions are required. This subpart is adapted from Minn. Rules pt. 7048.1200 subps. 1 though 6 for waste disposal facility certified operator sanctions. It is reasonable to adapt the waste disposal facility certified operator sanctioning system for use in this proposed rule since it is currently in use without major problems and many of the facilities that will be effected by the proposed rule are familiar with the system.

j. Subpart 10. Certification Deadlines. This subpart establishes the deadlines by which those persons of whom certification is required must obtain certification. This subpart adopts the federal requirements set forth is 40 CFR 60.56a(d) and requires that persons employed as chief facility operators or shift supervisors at a Class A or B facility obtain certification before February 11, 1993. This subpart also requires that all other persons, of whom certification is required, obtain certification within two years of the effective date of this rule or normal start-up of the waste combustor, whichever is later. These persons are, or will be, employed as a chief facility operator or shift supervisor at a Class I, III, C, or D as an operator supervisor at a Class IV waste combustor. To maintain consistency with the federal regulations, it is reasonable to adopt these requirements.

19. Reasonableness of Part 7011.1285--Operating Records and Reports

The following addresses the reasonableness of the proposed operating records and reports requirements.

The maintenance of operating records and the reporting of those records as well as the results of compliance tests are necessary as a means of determining compliance with various provisions of the proposed rule. Additionally, federal regulations require the maintenance of certain records. In order for the proposed rule to be included in Minnesota's SIP by the EPA, it must accurately reflect the federal regulations. Therefore, it is necessary to require record keeping and reporting in the proposed rule. To ensure compliance with the proposed rule and to enhance the ability of the MPCA to determine a facility's compliance status, it is reasonable to propose additional record keeping and reporting requirements.

The most substantial recording and reporting requirements proposed in this part are the result of federal requirements for continuous monitoring of emissions and operating parameters. The federal regulations require continuous monitoring of emissions and operating parameters of large and very large municipal waste combustors (Classes I, A, and B). It is also apparent from the EPA proposal for the regulation of small municipal waste combustors that it is their intention to require continuous monitoring on small municipal waste combustors; Classes II and C (54 FR 52297 and 52250). The proposed rule reflects these current and anticipated rules and, in addition, requires continuous monitoring of Class III and D waste combustors operating parameters and for Class IV waste combustors continuous monitoring of the combustion chamber temperature. For the same reasons that it is reasonable to require monitoring of emissions and operating parameters, it is reasonable to require these facilities to record and report data collected from these monitors. Where it is possible, the reporting and continuous monitoring requirements have been reduced. For example, quarterly and annual reporting is not required of Class IV waste combustors.

Class III and D facilities are large industrial facilities like Andersen Windows Corp. and large medical facilities like Mayo Clinic. Continuous monitors at these facilities monitor operating parameters and are used to ensure that a waste combustor is operated within its proper operating envelope. If these waste combustors operate outside that envelope, they have the potential to emit significant quantities of pollutants. Continuously monitoring the operating parameters provides an effective tool in determining the compliance status of a waste combustor and verifying that a waste combustor was operated in accordance with good combustion practices. A Class III or D waste combustor is not required to continuously monitor sulfur dioxide and nitrogen oxides emissions.

An effort was made to reduce the burden on small business as much as possible. For this reason, a Class IV waste combustor is required to continuously monitor only the combustion chamber temperature. This is a relatively inexpensive monitor. The combustion chamber temperature is an important parameter to monitor to ensure waste combustor operations are in accordance with good combustion practices. Good combustion practices must be followed in order to comply with the emission limits.

In addition to these reasons, under the direction of the Legislative Audit Commission in May 1990, the MPCA is to increase the information it collects on pollution levels. Continuous monitoring will increase both the quantity and the quality of the information received from these sources.

For these reasons, it is necessary and reasonable to require continuous monitoring of emissions and/or operating parameters of all classifications of waste combustors.

a. Subpart 1. Operating Record. Subpart 1 requires the maintenance of an operating record. The proposed rule requires operating records to be kept for a period of five years. Federal regulations require operating and emission records to be maintained for a period of five years from the date of measurement or report. Since state operating permits for waste combustors will be issued for five years, it is reasonable to require that the operating record is kept for the same duration to allow review of the record for the entire permit period when reissuance is requested by the permittee. For Class IV waste combustors, where a permit is not issued, the operating log will be reviewed by MPCA personnel during inspections.

b. **Subpart 2. Daily Operating Record.** Subpart 2 establishes the requirements for the daily operating record. Most of the items set forth in this subpart are adopted from the federal regulations 40 CFR 60 subpart Ea. To maintain consistency with the federal regulations, it is reasonable to adopt those provisions. The requirements proposed in this subpart that are not required by federal regulation are included to determine compliance with provisions that are included in the proposed rule but are not part of the federal regulations.

Item A. Item A requires that the date is recorded on the daily record. This is required by the federal regulations (40 CFR 60.59a(b)(1)). It is reasonable to require the daily operating record to contain this information.

Item B. Item B requires that the hours of operation is recorded daily. This information is necessary to determine the percent up-time for the CEMS as required in both the federal regulations (40 CFR 60.59a(f)) and the proposed rule (7011.1260, subpart 5, item B). It is also a requirement of the existing incinerator rule (part 7011.1203). It is reasonable to require the daily operating record to contain this information.

Items C and D. Item C and D require that the weight of solid waste combusted and the weight of solid waste requiring disposal at a solid waste land disposal facility are recorded daily. Current Minnesota incinerator rules require the maintenance of a daily record of the weight of the waste combusted (part 7011.1204).

Proposed Minn. Rules pt. 7011.0501 requires an applicant for a MSW combustor air emissions permit to submit with the application a plan for the reduction in the total content and leachable levels of toxic contaminants in ash and a reduction in the quantity of ash and solid waste processing residuals requiring disposal. To determine if the plan has been implemented and is successful, it is necessary to know the weight of solid waste combusted, and the weight of solid waste requiring disposal at a landfill including non combustibles, excess solid waste and ash. Therefore, it is reasonable to require the daily operating record to contain this information.

Item E. Item E adopts the federal requirements set forth in 40 CFR 60.59a (b)(2)(i) and (ii) and requires that the operating parameters and emission rates that are measured continuously are recorded on the daily operating record. The emissions rates and parameters measured are: opacity, sulfur dioxide emission rate or percent reduction, nitrogen oxide emission rate, carbon monoxide emission rate, waste combustor load and particulate matter control device temperature. To maintain consistency with the federal regulations, it is reasonable to adopt this requirement.

Item F. Item F adopts the federal requirements set forth in 40 CFR 60.59a (b)(7) and requires that the results of performance tests conducted on the waste combustor units are recorded in the daily operating record. To maintain consistency with the federal regulations, it is reasonable to adopt this requirement.

Item G. Item G requires that incidents of dumpstack use are recorded on the daily operating record. During these incidents, the exhaust stream from the combustion chamber is vented directly to the atmosphere without passing through the pollution control devices. This means that the monitoring equipment is also by-passed. These incidents result in significant increases in emissions. The quantity of emissions is unknown. Frequent dumpstack use may also indicate facility problems that should be addressed or it may indicate use of the dumpstack for reasons other than those for which was intended and allowed (part 7011.1240, subpart 6). For these reasons, it is reasonable to require that these incidents are recorded in the daily operating record.

Item H. Item H adopts the federal requirements set forth in 40 CFR 60.59a(j) and requires that the names of personnel who have completed the initial or subsequent annual review of the operating manual are recorded in the daily operating record. This allows an inspector to determine who has been trained and if the training has been completed as required under part 7011.1275 and 40 CFR 60.56a(g). To maintain consistency with the federal regulations, it is reasonable to adopt this requirement.

Item I. Item I adopts the federal requirements set forth in 40 CFR 60.59a (b)(3) and requires that the reasons for exceeding any of the average emission rates, percent reductions or operating parameters specified in item C of this subpart and a description of the corrective action taken are recorded in the daily operating record. Currently, under Minn. Rules pt. 7019.2000, subp. 1, item B, subitem 2 this information must be submitted with the quarterly report. To maintain consistency with the federal regulations and since this information is already being reported, it is reasonable to require that this information is recorded in the daily operating record.

Item J. Item J adopts the federal requirements set forth in 40 CFR 60.59a (b)(4) and requires that the reasons for not obtaining the minimum number of hours of sulfur dioxide or nitrogen oxides emissions or operational data and a description of the corrective action taken are recorded in the daily operating record. Currently, under permit conditions, the owner or operator is required to submit a down-time report on a monthly basis. It is reasonable to require that the owner or operator record reasons for CEMS down-time in addition to reporting it. Also, to maintain consistency with the federal regulations, it is necessary and reasonable to require that this information is recorded in the daily operating record.

c. **Subpart 3. Quarterly Reports.** Subpart 3 establishes the requirements for the quarterly reports including the deadlines for submittal of the reports. Most of the items set forth in this subpart are adopted from the federal regulations 40 CFR 60 subpart Ea. To maintain consistency with the federal regulations and since quarterly reports are currently required for CEMS under Minn. Rule pt. 7011.0100, subp. 1, it is reasonable to adopt these provisions. The requirements set forth in this subpart that are not required by federal regulation are included to determine compliance with provisions that are included in the proposed rule but are not part of the federal regulations.

Item A. Item A requires the report to include the calendar date. It is reasonable to require the date to properly identify the quarter to which the report belongs.

Item B. Item B adopts the federal requirements set forth in 40 CFR 60.59a(e) and requires the owner or operator to report the averages of the operating parameters and air emission rates recorded in subpart 2, item F of this part. To maintain consistency with the federal regulations, it is reasonable to adopt this requirement.

Item C. Item C requires the owner or operator to report instances of dumpstack use. For the same reasons that it is reasonable to record instances of dumpstack use (subpart 2, item G of this part), it is also reasonable to require the reporting of these instances.

Item D. Item D adopts the federal requirements set forth in 40 CFR 60.59a(e) and requires the owner or operator to report the operating days when the average emission rates, percent reductions or operating parameters as recorded under subpart 2, item I of this part exceeded the applicable limits, the reasons for the exceedance, and a description of the corrective action taken. Most of the information required in this item is currently required in Minn. Rules pt. 7019.2000, subp. 1, item b, subitem 2. The additional information required under this item are exceedances of operating parameters and percent reductions of emissions. To maintain consistency with the federal regulations and since most of the information required under this item is already being reported, it is reasonable to adopt this requirement.

Item E. Item E adopts the federal requirements set forth in 40 CFR 60.59a(f) and requires the owner or operator to report the percent of the operating time that the opacity CEMS was operating and collecting valid data. Currently, under permit conditions (Permit Exhibit B), the owner or operator is required to submit a down-time report on a monthly basis. To maintain consistency with the federal regulations and since owners and operators of facilities required to have CEMS already comply with this requirement, it is reasonable to adopt this requirement into the proposed rule.

Item F. Item F adopts the federal requirements set forth in 40 CFR 60.59a(e) and requires the owner or operator to report the operating days when the minimum number of hours of sulfur dioxide or nitrogen oxides emissions or operational data was not obtained, including reasons for not obtaining sufficient data and a description of the corrective action taken. To maintain consistency with the federal regulations, it is reasonable to adopt this requirement.

Item G. Item G adopts the federal requirements set forth in 40 CFR 60.59a(e) and requires the owner or operator to report the results of daily sulfur dioxide, nitrogen oxides and carbon monoxide CEMS drift tests and accuracy assessments. Currently, owners and operators are required under Minn. Rules pt. 7019.2000, subp. 2 to record this information. To maintain consistency with the federal regulations and since the information is already recorded, it is reasonable to require that this information is reported.

d. Subpart 4. Annual Reports. Subpart 4 establishes the requirements for the annual reports including the deadline for submittal. Annual reports are a requirement of the federal regulation for Class A, B and I waste combustors (40 CFR 60.59a(g)). Currently, a permittee must submit an annual report consisting of at least an emissions inventory (Minn. Rules pt. 7019.2000, subp. 4). To maintain consistency with the federal regulations and since annual reports are already required for large waste combustors, it is reasonable to continue to require annual reports. In addition to the information required by federal regulation, the proposed rule requires an overall summary of shutdowns and breakdowns and certification of the report.

This annual report requirement is also extended to Class C, D, II, III and IV waste combustors. Since other parts of the proposed rule establish various record keeping requirements, the MPCA will be able to review reports and determine whether operations are maintained properly, and whether the facility is in compliance with personnel training and operator certification requirements.

Item A. Item A adopts the federal requirements set forth in 40 CFR 60.59a(g) and requires that the owner or operator summarize and report the information required in subpart 2 of this part. To maintain consistency with the federal regulations, it is reasonable to adopt this requirement.

Items B and C. Items B and C require the owner or operator to summarize and report the incidents of shutdown or breakdown and excess emissions that occurred in the previous year. This is meant to be a tool for both the MPCA and the owner or operator in evaluating the overall performance of the waste combustor. It is meant to highlight areas which, if they were given attention may reduce costs for the owner and emissions to the atmosphere. For these reasons, it is reasonable to require this in addition to the federally required provisions of the annual report.

Item E. Item E requires the owner or operator and the compliance officer to make the certification in Minn. Rules pt. 7001.0070. This certification states that the information presented in the report is, to the best of the person's knowledge, true, accurate and complete. This certification provides the MPCA with some leverage to ensure truthful, accurate and complete reporting. MPCA believes that under the threat of sanctions, which under the CAAA of 1990 could include imprisonment, an owner or operator would be less likely to negligently or intentionally submit a false report.

e. **Subpart 5.** Subpart 5 adopts the federal requirements set forth in 40 CFR 60.59a(c) and requires that the owner or operator report the results of the initial compliance test as required under Minn. Rules pt. 7011.1270. To maintain consistency with the federal regulations, it is reasonable to adopt this requirement.

f. **Subpart 6.** Subpart 6 adopts the federal requirement set forth in 40 CFR 60.59a and requires that the owner or operator report the results of performance tests conducted to determine compliance. The report shall be submitted within 14 days of the owner's or operator's receipt of the performance test results. Fourteen days is a reasonable amount of time for the owner or operator to review the results and to submit the report to the MPCA. To maintain consistency with the federal regulations, it is reasonable to adopt this requirement.

20. Reasonablenss of Part 7017.1000--Continuous Monitoring

This part currently describes the general specifications to which all continuous emission monitors in Minnesota are to be installed, calibrated and operated. Proposed part 7011.1260, Continuous Monitoring, requires that continuous monitors comply with part 7017.1000.

On February 11, 1991, EPA adopted an additional performance standard applicable to carbon monoxide continuous monitors (40 CFR Part 60 Appendix B Performance Specification 4A). This specification applies to continuous carbon monoxide monitors installed under the federal emission guidelines and the federal new source performance standards. Subpart 2 is amended to include the reference to this performance specification.

SECTION V. IMPACTS ON SMALL BUSINESSES

The MPCA is required to consider the impacts of proposed rules on small businesses:

Subd. 1. Definition. For purposes of this section, "small business" means a business entity, including its affiliates, that (a) is independently owned and operated; (b) is not dominant in its field; and (c) employs fewer than 50 full-time employees or has gross sales of less than $4,000,000. For purposes of a specific rule, an agency may define small business to include more employees if necessary to adapt the rule to the needs and problems of small businesses.

Subd. 2. Impact on small business. When an agency proposes a new rule, or an amendment to an existing rule, which may affect small businesses as defined by this section, the agency shall consider each of the following methods for reducing the impact of the rule on small businesses: (a) the establishment of less stringent compliance or reporting requirements for small businesses; (b) the establishment of less stringent schedules or deadlines for compliance or reporting requirements for small businesses; (c) the consolidation or simplification of compliance or reporting requirements for small businesses; (d) the establishment of performance standards for small businesses to replace design or operational standards required in the rule; and (e) the exemption of small businesses from any or all requirements of the rule. In its statement of need and reasonableness, the agency shall document how it has considered these methods and results.

Subd. 3. Feasibility. The agency shall incorporate into the proposed rule or amendment any of the methods specified under subdivision 2 that it finds to be feasible, unless doing so would be contrary to the statutory objectives that are the basis of the proposed rulemaking.

Subd. 4. Small business participation in rulemaking. In addition to the requirements under section 14.14, the agency shall provide an opportunity for small businesses to participate in the rulemaking process, utilizing one or more of the following methods; (a) the inclusion in any advance notice of proposed rulemaking of a statement that the rule will have an impact on small businesses which shall include a description of the probably quantitative and qualitative impact of the proposed rule, economic or otherwise, upon affected classes of persons; or (b) the publication of a notice of the proposed rulemaking in publications likely to be obtained by small businesses that would be affected by the rule; or (c) the direct notification of any small business that may be affected by the rule; or (d) the conduct of public hearings concerning the impact of the rule on small businesses.

Minn. Stat. § 14.115 (1992).

Most of the business firms affected by the proposed rules are small businesses. There are a few large firms (e.g., NSP, Andersen Corp.), but the largest single class of affected firms in terms of number is groceries. Although some stores may be outside the small business class, it seems that the majority of groceries meet the small business definition. Other affected business sectors have mixed structures, with both small and large firms sharing and no clear pattern of dominance.

In general, waste combustion is more likely to be used as a means of waste disposal by a company or institute rather than being a company's major or sole source of income. There are exceptions to this; Medical Safety System in Cannon Falls is a commercial medical waste incinerator, and metal recovery incinerators are major sources of income for two companies in Minnesota. However, the vast majority of waste combustors are operated for the sole purpose of on-site disposal of waste. The majority of the small businesses, which operate a waste combustor, operate a Class IV waste combustor (less than 3 MMBtu/h heat input from waste burned). The requirements for Class IV waste combustors (when compared to other classes of waste combustors) received the most attention in regard to making allowances for small businesses.

The rule proposes that no person shall operate a Class IV waste combustor unless the waste combustor is:

a hospital waste combustor;
a crematorium, pathological waste combustor or a waste combustor used solely for the disposal of animal carcasses;
a metals recovery incinerator; or
used for the disposal of forensic laboratory waste.

Since there are few providers of commercial medical waste disposal in Minnesota, it was decided that to propose a ban on hospital waste incinerators could place hospitals at the mercy of these few providers. This could result in ever increasing disposal costs. For this reason, hospitals will be exempted from the ban on small incinerators.

All incinerators, including hospital incinerators will be required to meet more strict emissions standards, will be required to better maintain the incinerators and will be required to keep better records. This will increase the cost of operating an incinerator over the current costs. While the cost to operate an incinerator will increase under the proposed rule, there are options available to some hospitals that may result in costs lower than those that are currently incurred by incinerating waste (Exhibit 3). The degree to which the proposed rule financially impacts any individual hospital is within the control of that hospital and is dependent upon the choices that are made by the hospital.

Crematoria, pathological waste combustors and animal carcass incinerators are exempted from the ban because there is no substitute or adequate substitute for them. To control the spread of disease among poultry, diseased carcasses must be disposed of; because the carcasses are diseased, they cannot be rendered. Therefore, the carcasses must be incinerated.

Metal recovery incineration also has no adequate substitute. This is the process of recovering metal from the ash which remains after components which contain precious and non precious metal are incinerated. Also, as stated earlier, metal recovery incinerators are the major or sole income generator for at least two small businesses in Minnesota. Banning these incinerators could result in closing these companies.

Due to legal requirements for handling and disposing of seized drugs and evidence in criminal cases, the Bureau of Criminal Apprehension and other forensic laboratories in Minnesota operate Class IV waste combustors. Since there are legal requirements for the disposal of these items, this use is exempted from the ban on Class IV waste combustors.

In the process of preparing the proposed rule, the MPCA tried to determine the rate of compliance with the existing standards amongst hospital which operate infectious waste incinerators. The MPCA also required demonstration of compliance with the existing standards. The result of this effort was the voluntary shutdown of the majority of the hospital incinerators in Minnesota. Apparently the hospitals decided that it was easier and less expensive to use an alternative method of infectious waste and solid waste disposal than to invest the money necessary to bring the units into compliance. This is supported by cost estimates that were prepared by MPCA staff (Exhibit 3, pp. 98). Currently, approximately 35 of the 160 or so hospitals in Minnesota operate an on-site incinerator; this is less than half the number of facilities that operated an incinerator before it was required for them to demonstrate compliance. Most of the hospitals that currently operate an incinerator or are in the process of upgrading their incinerator will comply with the new standards of performance that are proposed in this rule. The significance of what was learned from this effort is that the majority of the small waste combustors were out of compliance with the existing standards and were then voluntarily shutdown when compliance was required.

The businesses for which the proposed ban will have the greatest effect is the grocery stores which operate incinerators to dispose of corrugated boxes and other wastes. The Minnesota Grocer's Association estimates that approximately 1/3 of the 3,000 or so grocery stores in Minnesota currently operate an incinerator. MPCA staff believes that the compliance status of these waste combustors is similar to the status of hospitals before demonstration of compliance was required. The MPCA staff believes that if compliance demonstration with the existing standards was required of incinerators at grocery stores, most owners would voluntarily cease operation of the incinerator rather than spend the money to bring the incinerator into compliance. Forcing this demonstration of compliance would take considerable effort on the part of the MPCA enforcement staff.

In proposing this part of the rule, MPCA considered imposing new standards of performance for these waste combustors. An estimate of the cost to comply with the proposed Class IV standards of performance was conducted by MPCA staff (Exhibit 3, Chapter 7). For grocery stores, the estimated cost to install and operate an incinerator that would comply with the proposed standards is approximately three and one-half times the cost to use the MSW system for all wastes generated and six the cost to recycle the corrugated and use the MSW system for the remaining waste. The estimated cost to operate an existing incinerator that would comply with the existing standards is approximately fifteen percent more than the cost to recycle and use the MSW system and approximately thirty percent less than to use the MSW system for all wastes generated.

Banning Class IV waste combustors, with the exception of those previously discussed, was carefully considered by the MPCA and for the following reasons, it is reasonable to propose a ban on Class IV waste combustors:

> Little or no economic burden for incinerator owners will result from the ban; there are numerous alternatives available to these facilities including recycling and the municipal solid waste system at either a savings or little additional cost.
>
> The intent of the proposed rule is to reduce emissions from incinerators and therefore if the ban is not proposed, new, more stringent, standards will be proposed which will require much greater expense by the owner of the incinerator to comply.
>
> The bureaucratic and economic burden to the waste combustor owner and the MPCA to bring these waste combustors into compliance would be great.
>
> The experience with hospitals in Minnesota demonstrate that most would voluntarily shutdown the incinerators rather than spend the money required to comply with the existing rules. By proposing the ban, false hope on the part of incinerator owners of an inexpensive way to operate an incinerator and comply with the rule (current or proposed) is avoided.

The economic impact of the ban on Class IV waste combustors on small businesses in the commercial industrial was also estimated with results similar to those for grocery stores (Exhibit 3, pp. 148)

To lessen the burden on small businesses, the rule proposes the following allowances for Class IV waste combustors.

For hospitals, instead of requiring a permit application, a notification of the existence of the waste combustor is required and, unlike a permit, this notification does not expire. This notification does not require stack emissions dispersion modeling (an exercise that estimates the concentration of pollutants at ground level in the vicinity of the exhaust stack) or an industrial waste management plan as required of other waste combustor classes.

The required stack testing is reduced to once every five years. This will save the owner of the waste combustor the money to have the testing conducted and the reduce the administrative and financial burden of reporting the results of those tests.

The number of pollutants for which an emission limit is proposed is reduced. No emission limits are proposed for acid gases (SO_2, NOx, and HCl), dioxins, or mercury. This significantly reduces the equipment costs, testing and reporting costs. It reduces the equipment costs by not requiring acid gas scrubbing and the continuous monitoring of acid gas emissions and carbon injection for mercury control. The only continuous monitoring requirement for Class IV waste combustors is combustion chamber temperature monitoring (a relatively inexpensive equipment cost).

The emission limits and design requirements that are proposed are established at a level that is achievable with good combustion equipment and the implementation of good combustion practice.

Training of personnel and certification of key personnel, including operators, is required to implement good combustion practice. The training and certification requirements were tailored to accommodate the smaller facilities, the resources available to them and the smaller quantity of pollutants emitted from Class IV waste combustors.

The monitoring and reporting requirements have also been reduced in recognition of the available resources and smaller quantity of pollutants emitted by Class IV waste combustors.

The burden on small businesses in general was considered throughout the drafting of the proposed rule including soliciting comments from affected parties on the proposed rule and on the cost estimates that were prepared by MPCA staff. Comments regarding the rule were incorporated to the maximum extent possible without significantly compromising the rule. Comments regarding the estimated costs were few; those comments that were received were taken into consideration when preparing the final draft of both the estimates and the rule.

SECTION VI. ECONOMIC IMPACTS EVALUATION

A. INTRODUCTION

The MPCA is required to take economic matters into account in its rulemaking activities:

> In exercising all its powers the pollution control agency shall give due consideration to the establishment, maintenance, operation and expansion of business, commerce, trade, industry, traffic, and other economic factors and other material matters affecting the feasibility and practicability of any proposed action, including, but not limited to, the burden on a municipality of any tax which may result therefrom, and shall take or provide for such action as may be reasonable, feasible, and practical under the circumstances.
>
> Minn. Stat. § 116.07, subd. 6

This law has general applicability to all actions of the MPCA. In the rulemaking context, this law has been interpreted by the MPCA to mean that, in determining whether to adopt proposed rules or amendments, the MPCA must consider, among other evidence, the impact that economic factors may have on the feasibility and practicability of the proposed rules or amendments. In Finding No. 4 of the MPCA's Findings of Fact and Conclusions In the Matter of the Proposed Revision to Minn. Rule APC 1, 6 MCAR sec. 4.0001. Relating to Ambient Air Quality Standards, the MPCA discussed the requirements of Minn. Stat. sec. 116.07, subd. 6 as follows:

> In order for the Agency to duly consider economic factors when it determines whether to adopt the amendments to Minn. Rule APC 1, the record upon which the Agency will make its determination must include data on the economic impacts of those amendments. These economic impacts, however, need not be quantified with absolute certainty in order to be considered. Further, these economic impacts may include costs other than the cost of complying with a proposed rule. For instance, material losses, crop losses, health costs, and impacts on tourism are also economic factors that should be duly considered by the Agency in determining whether to adopt the amendments to Minn. Rule APC 1.

Public policy decisions must weigh the values of competing goals. The law and the administrative interpretation cited show that the Legislature and the MPCA recognize the need to take into account different, sometimes competing, goals when setting environmental policy. Budget constraints in all economic sectors and at all income levels require decision makers to choose among programs and projects that compete for scarce budget resources.

This is a cautionary note telling the MPCA to be mindful of economic and financial limits. The MPCA's work consists of the application and enforcement of environmental laws. The MPCA tries always to work with Minnesota's citizens, businesses and civic organizations to design, deliver and improve environmental programs.

This work is not done without cost. Environmental laws and regulations impose costs on people, businesses and other institutions. Some of the state's economic capacity must be devoted to environmental protection. The MPCA is directed to take care that environmental regulations do not strain the limits of available economic resources. The MPCA generally takes this directive a step further, seeking least-cost regulatory solutions over affordable ones if least-cost solutions do not compromise environmental goals.

B. COST ESTIMATE PREPARATION

Waste combustor Class D (3.0 or more MMBtu/hr combusting waste other than MSW or RDF in operation on or before December 20, 1989) was added to the proposed rule after Exhibit 3 (Estimated Cost of Waste Disposal/Incineration and Alternatives) was completed and, therefore, none of the developed costs are specifically assigned to Class D waste combustors. However, the estimated costs to comply with the proposed rule for Class D waste combustors were prepared and are presented in Exhibit 3 as the estimated cost to comply for existing Class III waste combustors.

Exhibit 3 also presents the estimated cost to comply for new Class III waste combustors. This is the estimated cost to construct and operate a new 3 to 15 MMBtu/hr waste combustor. These waste combustors are still defined as Class III waste combustors. The costs presented in Exhibit 3 are used to estimate the impact of the proposed rule on Minnesota's economy. Because Class D waste combustors are in existence and it is possible to estimate the number of units currently operating in Minnesota and there is no way to predict how many, if any, new Class III waste combustors will be built., the estimated costs for Class D waste combustors to comply are used in the estimate of the economic impact. Therefore, when costs associated with Class D are presented in this section of the SONAR, the reader should refer to costs for existing Class III in Exhibit 3.

The EPA published two documents for the estimation of costs to construct new and retrofit existing municipal waste combustors with the equipment necessary to bring the facilities into compliance with the promulgated federal standards of performance and emission guidelines (Refs. 187 and 188). Both of these documents are based, in part, on the "OAQPS (Office of Air Quality Planning and Standards) Control Cost Manual, Fourth Edition" (Ref. 189).

The documents set forth algorithms to estimate the capital and annual costs to construct or retrofit air pollution control equipment. The EPA estimated the accuracy of the algorithms to be plus or minus thirty percent. The algorithms estimated the cost in December 1987. The MPCA adjusted the estimated costs by twelve percent for inflation to 1992 dollars. For non municipal waste combustors, the cost estimates were prepared using the OAQPS Control Cost Manual, vendor quotes, interviews with facility owners and operators, interviews with vendors, interviews with consultants, (when information was unavailable or incomplete) engineering judgment and the workpaper "Particulate and Dioxin/Furan Air Pollution Control Techniques for Class III Incinerators" (Ref. 190).

The estimated capital and annual costs, in thousands of dollars, to comply with the proposed rule is as follows:

Table 37. Costs to Comply with the Proposed Waste Combustor Rules
(Thousands 1992 Dollars)
(Appendix 7)

Waste Combustor Class	A & B	C	D	IV	Hosp	Total
Capital Costs	27,717	14,597	13,220	22,55	7,280	85,364
Annual Costs	7,328	2,293	3,370	(920)	1,866	13,937

Operating waste combustors in Minnesota will need to spend an estimated $85 million dollars to comply with the rule requirements. This capital cost and operating costs results in additional annual costs for operating waste combustors of $13.9 million. Class IV waste combustor operators will save an estimated $$920,000 annually because using a waste disposal alternative other than combustion is cheaper.

C. SIMULATION OF ECONOMIC IMPACTS

This analysis of economic impacts covers a range that is, at first, constrained to sectors directly affected and then broadens out to include all of the state's economic sectors. A model of the state's economy makes this possible. The Department of Revenue and other state agencies use this Economic and Demographic Forecasting and Simulation Model (EDFS-53) to evaluate the economic effects of proposed projects, laws and rules. The model gets its results by solving a set of equations that describe the interrelated activities of a local economy. This chapter will describe the model's basic structure. The Technical Work Paper titled "The REMI EDFS Model" is provided in Exhibit 6 for those who want a more detailed description.

The EDFS-53 can be considered as a series of linkages. For example, one factor of primary concern in economic impact studies, employment, is linked to a series of other factors such as wage rates, demand and production costs. Three groups of linkages form the model's basic structure.

1. Demand and Supply Linkages

Local and external demand determine gross state output. This is the total value of goods and services produced within the state. The state's output thus depends on the strength of consumers' desires for the goods and services that can be offered in the state. The EDFS-53 takes into account the goods and services each economic sector demands from all other sectors. These sectoral demands are further subdivided into the familiar elements of macroeconomic studies: consumption, investment, government spending and trade. An accountant's picture of gross state output would look like this:

1.	Total consumption	C
2.	Total investment	+I
3.	Total government spending	+G
4.	Total exports	+Ex
5.	Total imports	-Im
	Gross state output	Y

2. Cost Linkages

The costs of goods and services have important effects on supply and demand. Every good and service competes with all other goods and services for a share of the consumer's budget. If all other things remain equal and the price of a product rises, consumers will demand less of the product. They will either find substitutes or they will make do with less. The availability (measured as relative cost) of substitutes and the strength (measured as "elasticity") of demand also matter.

Cost considerations matter because policy makers often are concerned with issues that go beyond total output. They want to know what changes in total output mean in terms of investment and employment as well. For example, increases in labor costs (e.g., new payroll taxes) may lead employers to substitute capital for labor.

The EDFS-53 includes these influences through the use of statements made in functional form (Cobb-Douglas) that describe the relation between output and production costs. Firms buy labor and capital in order to produce goods and services. These purchased inputs are called factors of production. The amount of each factor that a firm hires depends on factor costs and the strength of demand for the firm's product(s). The variables in the EDFS-53 production functions include: sectoral demand, the relationship of local wage rates to national wage rates, the relative cost of capital, fuel costs, and the output/employment ratio. Production values further depend on relationships determined within the EDFS-53 that are referred to as Regional Purchase Coefficients (RPCs). The RPC measures the amount of total demand that is supplied by local firms. Local production depends on production costs relative to the rest of the nation, local industry growth trends and the strength of export demand.

3. Wage Determination Linkages

Labor wage rates influence relative factor costs. The EDFS-53 includes a separate set of relationships that determines wage rates. The model calculates wage rates for each industrial sector, depending on wages for each occupational group within the industry (weighted by each occupation's share of industry employment), local trends and wage factors not related to occupational supply and demand. Local wages for occupational groups depend on demand for labor in that occupation, population, and a wage growth factor that takes into account current and past wages.

The linkages describe the framework of the EDFS-53 and relate this framework to the conventional description of how mature economies work. The next step is to use this framework to forecast development and to measure the effects of specific changes. Survey data are compiled so that they can be used within the EDFS-53 system of equations.

National data compiled by federal agencies provide the foundation for the model. The Technical Work Paper titled "Data Sources and Estimation/Calibration Procedures" describes the sources of the data used in the model. Input/output (I/O) tables, developed by the U.S. Commerce Department's Bureau of Economic Analysis, provide structure for the model of the local economy. The I/O tables present an information series on the way national economic sectors relate to each other.

An economy, like a natural system, consists of identifiable groups that interact in complex and dynamic ways. Business firms, nonprofit organizations and governments produce goods and services (supply) to meet the consumption needs (demand) of people and their organizations. A firm's output can satisfy either final demand (e.g., groceries) or intermediate demand (e.g., paper stock), in which case the product is used to make new goods or services.

Each economic sector in the I/O tables relates to every other sector in a way that is based on the resources it demands from other sectors in the form of goods or services. Likewise, each sector supplies some part of its final output to other sectors and to final demand. The strength of these relationships varies, depending on the specific conditions of each sector.

An example will help explain the I/O tables:

HYPOTHETICAL I/O TABLE

	Agr.	Mfg.	Svcs.	Final demand	Gross output
Agriculture	60	60	20	60	200
Manufacturing	40	25	90	80	235
Services	10	70	55	105	240
Value Added	90	80	75	245	

(Ref. 191)

The rows have the units of output from one sector that provide intermediate inputs for itself and other sectors along with output of finished goods and services. The service sector in this table provides 10 units to agriculture, 70 units to manufacturing, 55 units to itself and 105 units to final demand. This adds up to 240 units, which is called gross output. The columns present the demands made by each sector and the value added produced in each sector. The service sector buys 20 units of agricultural output, 90 units of manufacturing output and 55 units of its own output. Value added is the measure of the extra value economic activity within a sector has added to the inputs it buys. Notice that the value added is equal to gross output less the sum of the inputs demanded by the sector. In the example, value added for the service sector is 240 - (20+90+55) = 75.

The example is kept simple for instructive purposes. The I/O tables used in the EDFS-53 have nearly 500 economic sectors. The value of the I/O tables for this analysis is that any change made in one sector has effects in all other sectors. This feature means that the EDFS-53 methodology provides a comprehensive way to meet the statutory directive to consider "the establishment, maintenance, operation and expansion of business, commerce, trade, industry, traffic and other economic factors and other material matters affecting the feasibility and practicability of any proposed action ..." The EDFS-53 methodology also takes into account the relative strengths of inter-sectoral impacts, which depend on the extent to which some sectors rely on other sectors for productive inputs or economic demand. Thus, changes induced in one specific sector will have only slight effects on another sector that either demands little of the changed sector's output or supplies few of the changed sector's inputs. Conversely, a heavily-dependent sector will be strongly affected by induced changes.

A series of calibration and "bridging" adjustments reconcile the data from the I/O tables with data from a number of other sources. These other sources are used for two reasons. First, the other surveys are more recent than the benchmark I/O study. Including the later surveys' data in the model provides the model with more current information. Second, many of the other surveys contain regional data. The data provide the means (RPCs) to translate national economic statistics into a model that describes the economy of a single state.

The EDFS-53 provides a wide array of outputs, including the areas of legislative concern. Forecasts can be extended to the year 2035. Output tables can be made very brief or quite detailed. The information available from intermediate-level tables includes estimates for the 53 economic sectors on:

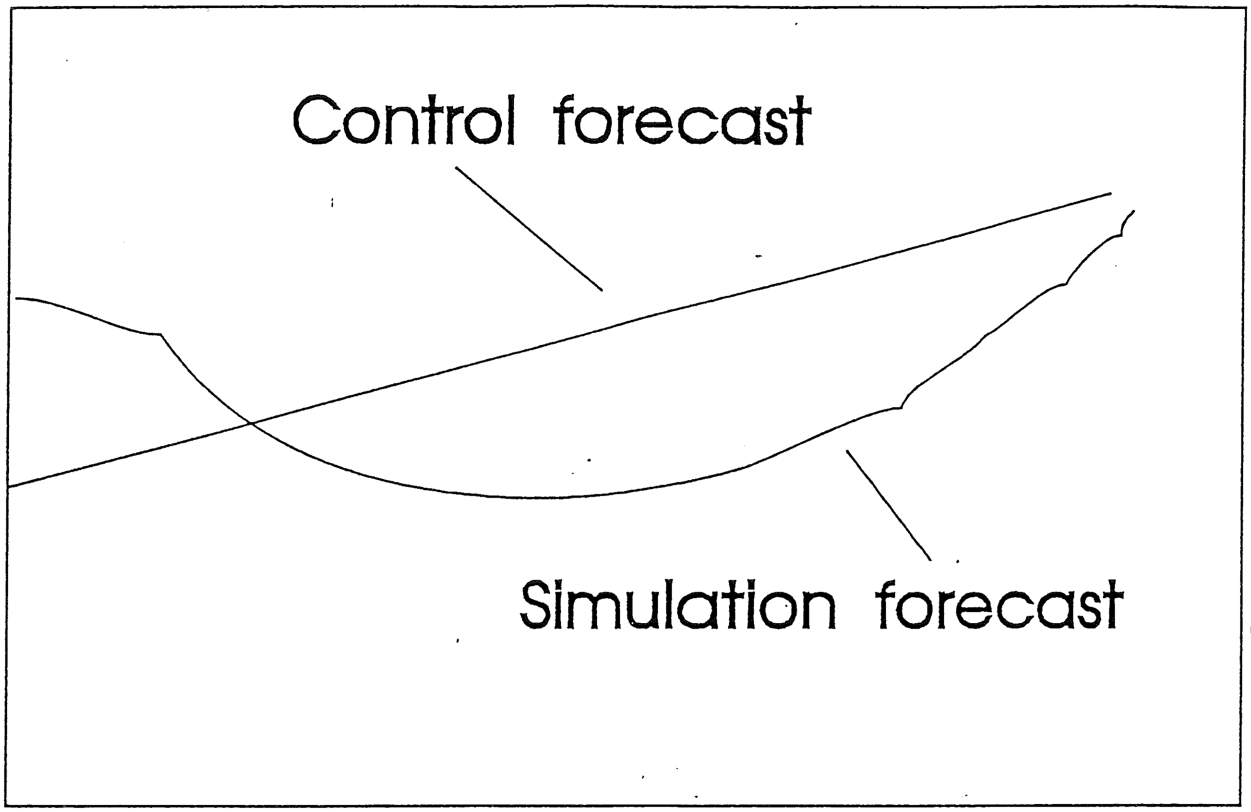
Employment, by occupation
Occupational wage rate changes
Private, non-farm employment
Various secondary employment effects
Sales prices, relative to the U.S.
Input costs, relative to the U.S.
Labor costs, relative to the U.S.
Fuel costs, relative to the U.S.
Capital costs, relative to the U.S.
Productivity, relative to the U.S.
Profits, relative to the U.S.
Labor intensity
Proportions of local demand supplied by local output
Total demand
Total imports
Various export measures
Total output
Gross regional product
Wage and salary disbursements

Some examples will show how the simulation model is used. Consider a proposal to increase income taxes. The amount of the increase would be introduced into the model through a single policy variable, "Personal Taxes." The likely effects of this change would include a decrease in statewide demand leading to lower employment and income. Consider another example under which a large manufacturer proposed to build a new plant in the state. This change could be simulated through increases in the demand for construction services, followed by employment increases in the manufacturer's sector. The Technical Work Paper titled "Policy Variables" has an annotated list of the policy variables used to simulate changes and includes, in the special translation policy variable section, a full list of the model's economic sectors in which changes can be made. Note that the sectoral list covers completely the areas described in the statutory directive that requires the MPCA to make this analysis.

The actual simulation of proposed changes is a three-step process. First, the economic model calculates a "control forecast." Next, policy variables are changed to simulate the effects of the proposal in question and the model's outputs are recalculated under the changed conditions. This yields a "simulation forecast." Finally, the model calculates the difference between the control forecast and the simulation forecast. This last value measures the impact of the simulated changes. Figure 10 illustrates the process.

Figure 10
Employment Effects

Jobs



Time

The difference between the simulation forecast and the control forecast estimates the impact of the proposed change on statewide employment. When the simulated effect is above the control forecast value, there are employment gains. When the simulation drops below the control, there are job losses.

The EDFS-53 has been used by the Minnesota Department of Revenue and by other state agencies. The basic model has also been adapted for use in other states, where it has received favorable evaluations. (See Exhibit 6 for the reviews. "Articles about Reviewing the Model"). The model's comprehensive scope and interactive operations suit it well to the analysis of economic impacts required by the law.

D. APPLICATIONS: VARIABLES USED TO SIMULATE EFFECTS OF THE PROPOSED RULES

The simulation of the economic impact of the proposed rules is done in four stages. First, the basic EDFS-53 control forecast is considered to represent current conditions in all affected sectors. This assumes that the proposed regulations are new for all affected firms.

The next stage features sector-level estimates of the financial impacts of the proposed rules. This analysis balances impacts among economic sectors. Resources moved from one sector must be fully spent in another sector. The simulation becomes a series of charges and revenues that affect different sectors in varying degrees and at different times. A charge to one economic sector is balanced by revenues received in other sectors, though the balance is not necessarily maintained from period to period. Imbalances can occur because the simulation assumes capital expenses are met through long-term borrowing. The effect of this assumption is to concentrate revenue increases in two years and to extend some charges for ten years.

The Exhibit 3 has the details of the cost estimates. The results are summarized in Table 38.

TABLE 38.
FINANCIAL IMPACT OF PROPOSED RULES
($1,000s, nominal)

FACILITY TYPE	EXPENSE CATEGORY EQUIPMENT	ENGINEERING	CONSTR.	O&M
Class IV:				
Capital	10,160	1,040	11,350	
Annual	1,660	160	1,870	(4,610)
Hospitals:				
Capital	5,029	910	1,310	31
Annual	825	149	214	678
Class D:				
Capital	6,840	1,750	4,630	
Annual	1,120	290	770	1,190
Classes A & B:				
Capital	15,327	3,593	2,323	6,474
Annual	2,015	472	306	4,535
Class C:				
Capital	7,053	931	4,071	2,542
Annual	927	72	535	759
TOTAL:				
Capital	44,409	8,224	23,684	9,047
Annual	6,547	1,143	3,695	2,552

The estimated impacts will not occur at the same time or in just one economic sector. Simulating the effects of the proposed rules requires setting up a schedule for all of the affected sectors. The schedule of estimated impacts is in Tables 39 and 40.

TABLE 39.
SCHEDULE OF FINANCIAL IMPACTS
($1,000s nominal)

EXPENSE SECTORS (EDFS-53 I.D. #)	1995	1996	1997
Class IV:			
Groceries (36)	(650)	(650)	(1,300)
Wholesale trade (37)	(60)	(60)	(120)
Metal Recovery (4)	250	250	500
Hospitals	887.5	887.5	1,775
Class D:			
Wood Products (1)	337	337	674
Printing (17)	337	337	674
Food, etc. (12)	1,011	1,011	2,022
Comm'l. disposal (30)	45.5	45.5	91
Classes A & B:			
Utilities (30)	3,664	3,664	7,328
Class C:			
Utilities (30)	1,008	1,008	2,106
Asphalt Prod. (19)			277
TOTAL ANNUAL COST			13,937

Table 40.
SCHEDULE OF FINANCIAL IMPACTS
($1,000s, nominal)

INCOME SECTORS (EDFS-53 I.D. #)	1995	1996	1997
Classes A, B & C:			
Equipment, etc. (6)	11,190		11,190
Engineering (46)	2,262		2,262
Construction (23)	3,197		3,197
Classes D & IV plus Hospitals:			
Equipment, etc. (6)	11,014.5		11,014.5
Engineering (46)	1,850		1,850
Construction (23)	8,645		8,645

EXPLANATORY NOTES:

1. The first financial impacts are scheduled to occur in 1995. This is two years after the earliest likely adoption date, which gives permittees time to make financial plans for the changes. The first impacts are limited to half of estimated costs. The second half of estimated costs is incurred two years later. Capital expenses are included in annual costs by amortizing them (ten years for Classes D, IV and Hospitals; fifteen years for Classes A, B and C) at a rate of ten per cent. Estimated costs after 1997 remain the same throughout the period evaluated.

2. The analysis extends from 1991 through 2005. The earlier years are included to show the current status of the affected economic sectors. The analysis then extends ten years beyond the first year of financial impact. Extending the analysis beyond the short term allows time for economic effects to stabilize so that long-term trends can be picked out.

3. The "Metal Recovery" classification is assigned to the Primary Metals sector of the model. The affected firms process waste materials in order to reclaim mineral elements that have value in secondary markets. For example, they process used and defective circuit boards to reclaim the precious metal in them. Metal recovery is included in the two-digit primary metals sector of the Standard Industrial Classification (SIC) code.

4. The estimated costs for Class D facilities are distributed among three different sectors. Facilities in the Wood Products and Printing sectors each comprise about twenty per cent of all facilities in this class. Facilities in the Food and Kindred Products sector comprise about 60 per cent of the class. Costs are distributed on a basis proportionate to the relative size of the sub-class.

5. Costs for two individual facilities are estimated separately. They occur in 1997. The first facility is Medical Safety Systems, an incinerator that primarily handles infectious wastes. Its costs are included in the Utilities sector of the model. The second facility is Richard's Asphalt, a production plant that burns MSW for fuel. Its costs are included in the Petroleum Products sector of the model.

6. Estimated capital costs in some sectors are balanced by income that accrues to other sectors. Equipment costs are added to sales in the Non-Electrical Machinery sector of the model, which includes a sub-class of firms that make electrostatic precipitators. Engineering costs are added to sales in the Miscellaneous Professional Services sector. The model has a separate sector for Construction sales.

Although costs are amortized, sales appear as one-time increases in the appropriate sectors. Half of the capital sales occur in 1995 and half occur in 1997. There are no further capital sales estimated for the period.

7. Not all costs are offset by income gains in other sectors. Operating and maintenance (O&M) costs are presented simply as increases in production costs in the affected sectors. This amounts to an assumption that the affected sectors buy no outside services to meet new O&M obligations.

8. The EDFS-53 model has built into it adjustments for interstate trade. Minnesota firms are not the only firms that sell goods and services in the state. Minnesota firms export to other states and Minnesota consumers and firms buy goods and services from other states. Domestic market shares for Minnesota firms are based on national data relating to interstate and international trade.

The model's assumptions about interstate trade do not fit with what is known about likely effects of the proposed rules. Some of the equipment needed to meet the rules' standards is not made in Minnesota. Likewise, some of the construction work needed will likely be handled by Minnesota firms. Three separate simulations are made to capture these different trade effects. First, a simulation is made without adjustments for unique interstate trade conditions. Second, a simulation is made in which firms in Classes A, B and C buy all their needed equipment in other states. Finally, a simulation is made in which all construction is done by domestic firms.

E. RESULTS: SIMULATED MACROECONOMIC IMPACTS OF PROPOSED RULES

The impacts considered here relate to two standard economic variables: employment and total output. Employment is measured in terms of private, non-farm jobs. Output is the total (nominal) value of goods and services produced in the state. Impacts on other variables (e.g., prices, trade, investment, etc.) have been calculated and can be provided if necessary. Trade impacts were considered but found to be below the levels estimated by the model.

The first column in the table below presents the EDFS-53 control forecast. This is the estimate of employment and output if the proposed rules are not adopted. The second column has the estimated effects of the proposed rules without making any adjustments for interstate trade. The third column has the simulation estimates that assume Class A, B and C equipment purchases are made in other states. The fourth column has the simulation estimates that assume all construction is done by local firms.

TABLE 41
IMPACT OF THE PROPOSED RULE ON EMPLOYMENT

	CONTROL FORECAST	UNADJUSTED SIMULATION	TRADE SIMULATION	CONSTRUCTION SIMULATION
EMPLOYMENT (thou. jobs)				
1991	2221.3	0.0	0.0	0.0
1992	2223.8	0.0	0.0	0.0
1993	2258.8	0.0	0.0	0.0
1994	2304.8	0.0	0.0	0.0
1995	2345.1	0.309	0.259	0.344
1996	2378.1	-0.106	-0.106	-0.106
1997	2417.2	0.144	0.103	0.174
1998	2458.4	-0.239	-0.238	-0.241
1999	2501.9	-0.265	-0.263	-0.269
2000	2546.6	-0.274	-0.271	-0.277
2001	3083.7	-0.276	-0.274	-0.279
2002	3133.8	-0.275	-0.273	-0.276
2003	3185.1	-0.272	-0.270	-0.273
2004	3238.3	-0.267	-0.266	-0.268
2005	3292.0	-0.261	-0.261	-0.262

TABLE 42
IMPACT OF THE PROPOSED RULE ON ECONOMIC OUTPUT

	CONTROL FORECAST	UNADJUSTED SIMULATION	TRADE SIMULATION	CONSTRUCTION SIMULATION
		TOTAL OUTPUT ($ billions)		
1991	148.4	0.0	0.0	0.0
1992	152.2	0.0	0.0	0.0
1993	156.7	0.0	0.0	0.0
1994	162.4	0.0	0.0	0.0
1995	165.4	0.022	0.017	0.024
1996	169.5	-0.008	-0.008	-0.008
1997	173.8	0.010	0.006	0.013
1998	178.4	-0.018	-0.018	-0.018
1999	183.1	-0.020	-0.020	-0.020
2000	187.9	-0.021	-0.021	-0.021
2001	193.0	-0.021	-0.021	-0.022
2002	198.2	-0.022	-0.022	-0.022
2003	203.6	-0.022	-0.021	-0.022
2004	209.2	-0.021	-0.021	-0.021
2005	214.9	-0.021	-0.021	-0.021

Tables 41 and 42 present a very general view of the rules' expected impact on the state's economy considered as a whole. The rules' impacts will not be distributed evenly throughout the whole economy. Some sectors will have relatively larger impacts. Table 43 shows some selected results for those sectors that are expected to experience the greatest impacts.

Table 43.
AFFECTED ECONOMIC SECTORS
EMPLOYMENT

(# of jobs)	CONSTRUCTION	RETAIL	MEDICAL	MISC. PROF. SERVICES	MACH. N-E
First year	1995	1995	1995	1995	
Largest plus	144	27	8	61	45
% of total	0.1	0.01	---	0.06	0.6
First year	1999	1999	2001	2003	1998
Largest minus	- 30	- 31	- 39	- 12	-3
% of total	-0.02	-0.01	-0.02	-0.01	----
OUTPUT ($ millions)					
First year	1995	1995	1995	1995	1995
Largest plus	9.7	0.9	0.3	2.6	6.2
% of total	0.1	0.01	---	0.06	0.06
First year	2000	2000	2003	2001	1999
Largest minus	- 2.4	- 1.2	- 1.7	- 0.5	- 0.5
% of total	-0.02	-0.01	-0.02	-0.01	----

In general, it does not look as though the proposed rules will have a large effect on the state's economy. Such general patterns as can be noticed indicate a slight positive effect in the early years. This occurs because we assume capital purchases will be financed through borrowing. After the initial positive effect, a slight negative impact takes over, building until around the year 2000 when it starts to decline slowly. The analysis indicates that the issue of primary legislative interest, the overall effect of proposed rules, is not large enough to cause concern.

There is, however, a pattern of effects that will operate below the level of the general economy. These are the impacts on the different sub-sectors which make up the general economy. The EDFS-53 simulations indicate that economic impacts are not very large even within the sectors most strongly affected by the proposed rules. The minor patterns found show slight net gains for Non-Electrical Machinery, Construction and Miscellaneous Professional Services and slight net losses for Retail Trade and Medical Services.

F. MICROECONOMIC EFFECTS

The sub-sectors in the EDFS-53 model are too large to show the greatest relative impacts. This is because the proposed rules' most direct effects will be limited to sub-sectors that are smaller than the ones in the EDFS-53. For example, the groceries affected by the Class IV incinerator prohibition are just one part of a larger sub-sector that includes all retail firms except those that serve food and drink. Likewise, the model's utilities sub-sector includes the Class A, B and C facilities affected by the proposed rules, but it also includes water, sewer and gas distribution systems as well.

We can sharpen the picture of the proposed rules' relative impacts by looking more closely at the estimates presented in Exhibit 3.

Consideration of microeconomic effects will not go down to the level of the individual firm. The appropriate time to consider firm-specific effects comes when individual permits are issued or renewed. That is when the details of individual conditions can be given full consideration.

Instead, this analysis will seek a middle ground between the economy-wide perspective of earlier sections and a tight focus on individual firms. Average cost estimates will be used to consider the proposed rules' financial impacts on the group of affected firms and their customers. For example, if all costs are shifted directly to local consumers in 1995, the total financial impact of the proposed rules will be about 0.007 per cent of estimated total personal income; the estimated 1997 proportion is about 0.01 per cent.

Sector-specific effects will depend on the strength of local demand and average profitability within the sector. At this level we can begin to consider, in general terms, the factors that influence firms' price and supply decisions. When a local manager finds out that state environmental regulations will impose new costs, the manager has two ways to plan to meet the new bills. Prices can be raised or other costs can be cut. Local conditions will limit the extent to which a manager can use one method or the other. Price increases may cause business to fall off and cost-cutting may affect the amount or quality of production. The local manager's choice depends on an evaluation of which method will cause the least loss of profit.

There is a class of firms for which the decision on how to pay the new bills is less complicated. These are the firms in classes A and B. They are the utilities whose rates are controlled by public bodies. The means of rate control are not consistent within this group, but the overall effect on rate changes is expected to be fairly uniform. Cost increases are generally passed directly on to consumers. The protections built into the regulated marketplace mean that utilities protected from competition will not fail if they must raise their prices a bit.

The situation is not as clear for the class C category of smaller municipal waste combustors. Recent legal actions have threatened their previously protected market positions. They are having to compete with other solid waste management facilities, some located in other states. Their competitive position is not as secure as that of the regulated power utility.

The facilities in class C have a mixed ownership structure. They are either public or publicly-controlled enterprises, but circumstances make them sensitive to market conditions. Some public owners or sponsors of these facilities have found ways to meet outside price competition. Local subsidies can be used to keep down facility service prices. The subsidies are financed through general service charges or general taxes.

Subsidy decisions are political decisions. Public groups (e.g., county commissions, joint powers boards) must decide how to manage the increased cost. Unit cost increases for this group are estimated to range in 1995 from $7 per ton to $33 per ton. These costs can be put into political perspective by comparing the possible range of cost increases to per capita income, which was about $19,000 in 1990. The EDFS-53 model estimates average per capita personal income will reach about $22,000 by 1995. Conventional wisdom and available data indicate that solid waste discards amount to about a ton per person per year. (This is a simple average of total solid waste disposal divided by population.) Using these averages, the estimated cost increases will range from 0.04 per cent to 0.15 per cent of per capita income. If the added charges are to be distributed evenly, the extra cost per household should tend toward the lower end of this range because businesses and other organizations would also be required to pick up their share.

Actual cost distributions and proportions will vary with differences in local conditions. Still, apart from extreme cases, it looks like some combination of cost controls, rate increases and service charge increases can be used to meet the added cost. The alternative of plant closing is generally considered unacceptable because the plants in this class are debt-financed. Closure would not eliminate all costs, but it would eliminate the benefits of running the plant.

Hospitals are another affected class that presents unique features. The MPCA staff estimates that the annual costs of compliance will range from $25,000 to $227,000, depending on hospital size Exhibit 3, pp. 98). Reported total expenses among all hospitals in 1989 were a bit over $3 billion (Ref. 192). Estimated total costs of compliance in 1995 will be about $445,000, increasing to $891,000 in 1997. If we use general price indexes from the EDFS-53 to inflate the 1989 expense report, we have total expense estimates of $3.9 billion in 1995 and $4.2 billion in 1997. The estimated costs of the proposed rules are 0.01 per cent of 1995 total estimated expenses and 0.02 per cent of 1997 total estimated expenses. The proposed rules do not seem to cause a large problem for the combined budgets of all hospitals.

However, the distribution of costs matters in this sub-sector. Minnesota has relatively few large hospitals and relatively many small hospitals. The proposed rules will impose the greatest relative costs on the small hospitals; those with less than 50 beds. MDH refers to this group as "Distressed Hospitals in Rural Minnesota." These hospitals have had to deal with both declining business and increasing cost in recent years. A number show net operating losses during the 1983 - 1989 period.

This sector of the state's economy is in the process of significant structural change. The number of small hospitals has been dropping for the past few years. It is likely that more small hospitals will close in the near future. Most hospitals are now changing both their service structures and their service delivery methods. If small hospitals cannot find service lines that are demanded locally and can be provided at reasonable cost, then their number will continue to drop. The proposed rules will not stop the process of structural change in the hospital sector.

The next affected group is not as uniform as the other classes. The class D facilities have waste combustors designed to handle three million to fifteen million BTUs per hour. The firms that have these waste combustors are in the wood products, printing, food processing and utilities sectors of the economy. There are nineteen firms in this class. Six of them are expected to find that it is cheaper to shut down than to upgrade their waste combustors. These firms are expected to realize a small net saving in waste disposal after facility shut down costs and alternative waste disposal costs are accounted for.

The other thirteen firms in this class are expected to upgrade their waste combustors. Total new costs for this group will be about $1.6 million in 1995 and 1996. Annual new costs will increase to $3.3 million in 1997. A simple annual average cost for this group is $123,000 in 1995 and 1996 and $254,000 in 1997.

The MPCA has no information on the financial positions of the affected firms in this class. The EDFS-53 model has some related sector-wide information that can be used to make general statements about the proposed rules' effects in each sector. Profitability varies in the affected firms' sectors. The printing and utilities sectors have average profit levels equal to the national average. Minnesota's wood products sector is more profitable than the national average and the food processing sector is less profitable than the national average. Average annual wages, forecast for 1995, in these sectors also vary from a low of $28,000 in the wood products sector to $45,000 in the utilities sector. Demand growth, forecast for 1991 - 1995, in the affected sectors varies from five per cent in food processing to fourteen per cent in wood products.

If average conditions in the affected firms' sectors are like individual firms' circumstances, there are some indications of the relative effects of the proposed rules. The firms in the wood products sector will have, on average, relatively greater profitability and demand prospects. They should have an easier time complying with the proposed rules. In the food processing sector, profits and demand growth are forecast to be relatively low while wage rates are forecast at moderate levels. Firms in the food processing sector may have a harder time complying with the proposed rules. Firms in the other two sectors should fall between these extremes.

The last affected group is Class IV, with waste combustors rated to handle up to three million BTUs per hour. The proposed rules are expected to be costly for one sub-group of this Class, which consists of three firms that operate ten metal recovery incinerators. Estimated annual total costs for this sub-group are $153,000 in 1995 and 1996 and $307,000 in 1997. Two firms have two metal recovery incinerators each, so, if average values hold, these firms' average annual costs will be $30,600 in 1995 and 1996 and $61,400 in 1997. Costs for the other firm, with six incinerators, will be higher - $91,800 in 1995 and 1996 and $184,200 in 1997. The EDFS-53 forecasts relatively low demand growth and profitability for firms in this sector.

The largest group of firms in Class IV consists of grocery stores (perhaps as many as 1,000) and a miscellaneous group (about 200) of commercial, industrial and institutional organizations. The MPCA staff estimates that these firms would save money if they shut down rather than upgrade their small waste combustors (Exhibit 3 page 148). The estimated savings take into account shut down costs and the cost of using other waste disposal methods. When the cost of enforcing the proposed rules for this large group was considered along with the net financial benefit of shut down, the MPCA staff decided to propose simply banning waste combustors rated at three million BTUs per hour. The MPCA staff estimates that the proposed rules will yield a net benefit for most of the firms in class IV.

SECTION VII. EXPENDITURES BY PUBLIC BODIES

The MPCA is required to consider the impacts of proposed rules on local public bodies:

> If the adoption of a rule by an agency will require the expenditure of public money by local public bodies, the appropriate notice of the agency's intent to adopt a rule shall be accompanied by a written statement giving the agency's reasonable estimate of the total cost to all local public bodies in the state to implement the rule for the two years immediately following adoption of the rule if the estimated total cost exceeds $100,000 in either of the two years. For purposes of this subdivision, local public bodies shall mean officers and governing bodies of the political subdivisions of the state and other officers and bodies of less than statewide jurisdiction which have the authority to levy taxes.
>
> Minn. Stat. § 14.11, subd. 1 (1992).

Some local governments own and operate MSW incinerators and hospitals. Table 44 shows the estimated costs, in thousands of dollars, for the government-owned MSW incinerators are:

TABLE 44.
ESTIMATED COST TO GOVERNMENT-OWNED MWCs
(Thousands of 1992 Dollars)

	EQUIPMENT	ENGR.	CONSTR.	O&M	TOTAL
Fergus Falls	$ 92	$ 2	$ 102	$ 122	$ 318
Olmsted Co.	88	49	67	152	356
Polk Co.	120	2	136	103	361
Pope/Douglas Co.	155	2	143	151	451
City of Red Wing	16	--	--	26	42
TOTALS	471	55	448	554	528

These are the estimated costs that will be incurred at the facilities when they comply with the proposed rules. The capital costs are amortized at a ten per cent rate for fifteen years. The

O&M costs will continue after the capital equipment debt is paid. The first costs are expected to be incurred within a year or two of the proposed rules' adoption.

Of the other MSW incinerators, most are privately-owned facilities that contract (directly or indirectly) to give exclusive service to county governments. The terms of the contracts vary widely. County governments may, in some cases, have to pay directly for the new costs. In other cases, costs may be passed directly on to customers. It is impractical to try estimating the distribution of costs for this group of incinerators because the extent of financial impacts depends on the details of their public/private contracts.

Some hospitals are owned and operated by public bodies. Some of these hospitals will be affected by the proposed rules. Three alternative solid waste disposal methods were evaluated in estimating the costs of the proposed rules. The estimates also took into account the size of the hospital. Table 45 presents estimated costs of solid waste disposal after the proposed rules take effect and assuming that the hospital uses its least-cost alternative disposal method.

TABLE 45.
ALTERNATIVE WASTE DISPOSAL METHODS

	HOSPITAL SIZE		
	50-bed	125-bed	300-bed
DISPOSAL METHOD			
Upgrade incinerator ($/ton)		$612	$441
Commercial disposal ($/ton)	$679 - 794	$510 - 660	$325 - 475
Total annual cost of least-cost alternative	$25,000	$95,000	$146,000

Table 46 presents the names and sizes of the publicly-owned hospitals that will be affected by the proposed rules.

TABLE 46.
PUBLICLY OWNED HOSPITALS

HOSPITAL	LICENSED BEDS (1991)
Cook Co. North Shore Hospital	16
Perham Memorial Hospital & Home	29
Chippewa Co. Montevideo Hospital	35
Northfield Hospital	37
Roseau Area Hospital & Home	45
Glencoe Area Health Center	49
Weiner Memorial Medical Center (Marshall)	62
Worthington Regional Center	88
Douglas Co. Hospital	127
Rice Memorial Hospital (Willmar)	136

The incurred costs expected for these hospitals will probably be related directly to size. However, costs are not expected to be distributed proportionately. That is, if hospital A is half the size of hospital B, its new costs will not likely be half of hospital B's also. Some economies of scale will likely cause unit costs to decline for larger hospitals.

VIII. IMPACTS ON AGRICULTURAL LANDS

The MPCA is required to consider the impacts of proposed rules on agricultural lands:

> If the Agency proposing the adoption of the rule determines that the rule may have a direct and substantial adverse impact on agricultural land in the state, the Agency shall comply with the requirements of sections 17.80 to 17.84.
>
> Minn. Stat. § 14.11, subd. 2 (1988)

The definition of adverse impact which applies in this case is:

> "Action which adversely affects" means any of the following actions taken in respect to agricultural land which have or would have the effect of substantially restricting the agricultural use of the land: (1) acquisition for a nonagricultural use except acquisition for any unit of the outdoor recreation system described in section 86A.05, other than a trail described in subdivision 4 of that section; (2) granting of a permit, license, franchise or other official authorization for nonagricultural use; (3) lease of state-owned land for nonagricultural use except for mineral exploration or mining; or (4) granting

> or loaning of state funds for purposes which are not consistent with agricultural use.
>
> Minn. Stat. § 17.81, subd. 2 (1988)

The Legislature has set agricultural land policies that guide administrative agencies' rulemaking efforts and determinations of adverse impact:

> It is the policy of the state to preserve agricultural land and conserve its long-term use for the production of food and other agricultural products by:
>
> (a) Protection of agricultural land and certain parcels of open space land from conversion to other uses;
> (b) Conservation and enhancement of soil and water resources to ensure their long-term quality and productivity;
> (c) Encouragement of planned growth and development of urban and rural areas to ensure the most effective use of agricultural land, resources and capital; and
> (d) Fostering of ownership and operation of agricultural land by resident farmers.
>
> Minn. Stat. § 17.80, subd. 1 (1988)

The proposed rules regulate solid waste incineration. They will have no effect on agricultural lands, except to the extent that better emission control protects farmland from contamination.

IX. CONCLUSIONS

Based on the foregoing arguments, the proposed and amended Minnesota Rules 7007.0200, 7007.0250, 7007.0501, 7007.0801, 7011.0551, 7011.0625, 7011.1201 to 7011.1285, and 7017.1000 are both needed and reasonable.

August 24, 1993

Charles W. Williams
Commissioner

X. LIST OF APPENDICES, EXHIBITS, REFERENCES, AND WITNESSES

A. LIST OF APPENDICES

APPENDIX 1
Standards of Performance for Incinerators, Minn. Rules ch. 7011.1201 to 7011.1207 (7005.0600 to 7005.0650).

APPENDIX 2
Estimate of Actual Emissions from Waste Combustors in Minnesota.

APPENDIX 3
40 CFR 60 Subpart Ea - Standards of Performance for Municipal Waste Combustors.
40 CFR 60 Subpart Ca - Emissions Guidelines and Compliance Times for Municipal Waste Combustors.

APPENDIX 4
Clean Air Act, Section 129. Combustion

APPENDIX 5
Memorandum from Ms. Nancy J. BodeAssistant Attorney General to Ms. Kathleen Winters, Special Assistant Attorney General. Re: BCA Incinerator. March 18, 1993.

APPENDIX 6
MInnesota State Laws Pertaining to Mercury

APPENDIX 7
Estimated Cost of the Proposed Rule for Each Waste Combustór Class and All Waste Combustor Classes.

B. LIST OF EXHIBITS

EXHIBIT 1
Minnesota Pollution Control Agency Technical Work Paper on Mercury Emissions from Waste Combustors. Prepared by David White, Radian Corp. and Anne Jackson, MPCA. December 1992.

EXHIBIT 2
ASME QRO-1-1989, Standard for the Qualification and Certification of Resource Recovery Facility Operators, March 31, 1990.

Proposed ASME QMO-1, Standard for the Qualification and Certification of Medical Waste Incinerator Operators, April 1992 Draft.

ASME PTC 4.1-1964, Reaffirmed 1973, 1979, 1985, 1991. Steam Generating Units Power Test Code.

American Society of Mechanical Engineers, New York, New York.

EXHIBIT 3
Estimated Cost of Waste Disposal/Incineration and Alternatives. Prepared by Michael Mondloch, Anne M. Jackson , Marion J. Kloster. Air Quality Division, Minnesota Pollution Control Agency, July 1993.

EXHIBIT 4
Technical Work Paper: Performance of APCD at Municipal Waste Combustor. Prepared by Anne M. Jackson, Air Quality Division, Minnesota Pollution Control Agency, June 1993.

EXHIBIT 5
Technical Workpaper: Control of Emissions from On-Site Waste Combustors. Prepared by Anne M. Jackson, Air Quality Division, Minnesota Pollution Control Agency, August 1993.

EXHIBIT 6
Economic Impact Model

The REMI EDFS Model
Model Documentation for the REMI EDFS-53 Forecasting and Simulation Model, March, 1992, Volume 1, Chapter 3.

Data Sources and Estimation /Calibration Procedures
from: Model Documentation for the REMI EDFS-53 Forecasting and Simulation Model, March, 1992, Volume 1, Chapter 4.

Policy Variables
from: Model Documentation for the REMI EDFS-53 Forecasting and Simulation Model, March, 1992, Volume 1, Chapter 11.

Articles About Reviewing the Model
from: Model Documentation for the REMI EDFS-53 Forecasting and Simulation Model, March, 1992, Volume 1, Chapter 11.

C. REFERENCES:

1. Report to the Legislative Commission on Waste Management Solid Waste Processing and Disposal: Capacity, Competition, Fees and Progress. June 15, 1990. Section A.

2. IWSA. "The 1992 Municipal Waste Combustion Guide", in Status of Municipal Waste Combustion in the United States: 1992 Update. Integrated Waste Services Association. Reprints from Waste Age, November, 1992. National Solid Wastes Management Association, copyright, 1992.

3. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, Draft Toxicological Profile for Lead, February 1988.

4. Sorensen, J.A., G.E. Glass, K.W. Schmidt, J.K. Huber, and G.R. Rapp Jr. 1990. Airborne mercury deposition and watershed characteristics in relation to mercury concentrations in water, sediments, plankton, and fish of eighty northern Minnesota lakes. Environmental Science and Technology 24(11):1716-1727.

5. MDH 1993. Minnesota Fish Consumption Advisory. Minnesota Department of Health. Minneapolis. 72 pp.

6. Swain, E.B., D.R. Engstrom, M.E. Brigham, T.A. Henning, and P.L. Brezonik. 1992. Increasing rates of atmospheric mercury deposition in midcontinental North America. Science 257:784-787.

7. Schuster, E. 1991. The behavior of mercury in the soil with special emphasis on complexation and adsorption processes -- a review of the literature. Water, Air and Soil Pollution 56:667-680.

8. Mierle, G. 1990. Aqueous inputs of mercury to Precambrian shield lakes in Ontario. Environmental Toxicology and Chemistry 9:843-851.

9. Aastrup, M., J. Johnson, E. Bringmark, and I. Bringmark. 1991. Occurrence and transport of mercury within a small catchment area. Water, Air and Soil Pollution 56:155-167.

10. Swain, E.B., D.R. Engstrom, M.E. Brigham, T.A. Henning, and P.L. Brezonik. 1992. Increasing rates of atmospheric mercury deposition in midcontinental North America. Science 257:784-787.

11. Bloom, N.S. 1992. On the chemical form of mercury in edible fish and marine invertebrate tissue. Canadian Journal of Fisheries and Aquatic Sciences 49: 1010-1017.

12. Lindqvist, O. ed. 1991. Mercury in the Swedish Environment: Recent Research on Causes, Consequences and Corrective Methods. Water, Air and Soil Pollution 55:v-261.

13. Fitzgerald, W.F. and T.W. Clarkson. 1991. Mercury and monomethylmercury: present and future concerns. Environmental Health Perspectives 96:159-166.

14. Fitzgerald, W.F. and T.W. Clarkson. 1991. Mercury and monomethylmercury: present and future concerns. Environmental Health Perspectives 96:159-166.

15. Swain, Edward B. and Daniel D. Helwig. "Mercury in Fish from Northeastern Minnesota Lakes: Historical Trends, Environmental Correlates, and Potential Sources" in Assessment of Mercury Contamination in Selected Minnesota Lakes and Streams. Ed. Edward Swain. MPCA report to the Legislative Commission on Minnesota Resources, 1989.

16. Sorensen, J.A., G.E. Glass, K.W. Schmidt, J.K. Huber, and G.R. Rapp Jr. 1990. Airborne mercury deposition and watershed characteristics in relation to mercury concentrations in water, sediments, plankton, and fish of eighty northern Minnesota lakes. Environmental Science and Technology 24(11):1716-1727.

17. MDNR 1977. Annual Report of Mercury Levels in Fish in the Mississippi, Red and St. Louis Rivers, Minnesota. Minnesota Department of Natural Resources. St. Paul. 19 pp.

18. Moyle, J.B. 1972. Mercury levels in Minnesota fish, 1970-71. Special Publication No. 97. Minnesota Department of Natural Resources. St. Paul.

19. Johnels, A.G., T. Westermark, W. Berg, P.I. Persson, and B. Sjostrand. 1967. Pike (Esox lucius L.) and some other aquatic organisms in Sweden as indicators of mercury contamination in the environment. Oikos 18:323-333.

20. Lindqvist, O. and H. Rodhe. 1985. Atmospheric mercury--a review. Tellus 37B: 136-159.

21. Lindqvist, O. and W.H. Schroeder. 1989. Cycling of mercury in the environment with emphasis on the importance of the element in acid rain studies. Pages 303-310 in J.M. Pacyna and (eds.). Control and Fate of Atmospheric Trace Metals. Kluwer Academic, Boston.

22. Swain, Edward B. and Daniel D. Helwig. "Mercury in Fish from Northeastern Minnesota Lakes: Historical Trends, Environmental Correlates, and Potential Sources" in Assessment of Mercury Contamination in Selected Minnesota Lakes and Streams. Ed. Edward Swain. MPCA report to the Legislative Commission on Minnesota Resources, 1989.

23. Lathrop, R.C., K.C. Noonan, P.M. Guenther, T.L. Brasino, and P.W. Rasmussen 1989. Mercury Levels in Walleyes from Wisconsin Lakes of Different Water and Sediment Chemistry Characteristics. Technical Bulletin No. 163. Wisconsin Department of Natural Resources. Madison. 40 pp.

24. Sorensen, J.A., G.E. Glass, K.W. Schmidt, J.K. Huber, and G.R. Rapp Jr. 1990. Airborne mercury deposition and watershed characteristics in relation to mercury concentrations in water, sediments, plankton, and fish of eighty northern Minnesota lakes. Environmental Science and Technology 24(11):1716-1727.

25. Swain, E.B., D.R. Engstrom, M.E. Brigham, T.A. Henning, and P.L. Brezonik. 1992. Increasing rates of atmospheric mercury deposition in midcontinental North America. Science 257:784-787.

26. Slemr, F. and E. Langer. 1992. Increase in global atmospheric concentrations of mercury inferred from measurements over the Atlantic Ocean. Nature 355:434- 437.

27. Swain, Edward B. and Daniel D. Helwig. "Mercury in Fish from Northeastern Minnesota Lakes: Historical Trends, Environmental Correlates, and Potential Sources" in Assessment of

Mercury Contamination in Selected Minnesota Lakes and Streams. Ed. Edward Swain. MPCA report to the Legislative Commission on Minnesota Resources, 1989.

28. Nriagu, J.O. 1989. A global assessment of natural sources of atmospheric trace metals. Nature 338:47-49.

29. Nater, E.A. and D.F. Grigal. 1992. Regional trends in mercury distribution across the Great Lakes states, north central USA. Nature 358:139-141.

30. Lathrop, R.C., P.W. Rasmussen, and D.R. Knauer. 1991. Mercury concentrations in walleyes from Wisconsin (USA) lakes. Water, Air and Soil Pollution 56:295- 307.

31. Grieb, T.M., C.T. Driscoll, S.P. Gloss, C.L. Schofield, G.L. Bowie, and D.B. Porcella. 1990. Factors affecting mercury accumulation in fish in the upper Michigan peninsula. Environmental Toxicology and Chemistry 9:919-930.

32. Lambou, V.W., T. Barkay, R.S. Braman, J.J. Delfino, J.J. Jansen, D. Nimmo, J.W. Parks, D.B. Porcella, J. Rudd, D. Schultz, J. Stober, C. Watras, J.G. Wiener, G. Gill, J. Huckabee, and B. Rood 1991. Mercury Technical Committee Interim Report. Center for Biomedical & Toxicological Research and Waste Management, Florida State University. Tallahassee. 60 pp.

33. RTI. Results of the 1989 Census of State Fish/Shellfish Consumption Advisory Programs. Report to the U.S. EPA. Research Triangle Institute. 1990.

34. Lindqvist, O. and H. Rodhe. 1985. Atmospheric mercury--a review. Tellus 37B: 136-159.

35. Lindqvist, O. and H. Rodhe. 1985. Atmospheric mercury--a review. Tellus 37B: 136-159.

36. Lindberg, S.E. 1987. Emission and deposition of atmospheric mercury vapor. Pages 89-106 in T.C. Hutchinson and (eds.). Lead, Mercury, Cadmium and Arsenic in the Environment. Wiley, New York.

37. Lindberg, S.E., R.R. Turner, T.P. Meyers, G.E. Taylor Jr., and W.H. Schroeder. 1991. Atmospheric concentrations and deposition of Hg to a deciduous forest at Walker Branch Watershed, Tennessee, USA. Water, Air and Soil Pollution 56:577-594.

38. Engstrom, D.R., E.B. Swain, T.A. Henning, M.E. Brigham, and P.L. Brezonik. in press. Atmospheric Mercury Deposition to Lakes and Watersheds: A Quantitative Reconstruction from Multiple Sediment Cores. L.A. Baker (ed.). Environmental Chemistry of Lakes and Reservoirs. American Chemical Society. Advances in Chemistry Series, Washington, D.C.

39. Nater, E.A. and D.F. Grigal. 1992. Regional trends in mercury distribution across the Great Lakes states, north central USA. Nature 358:139-141.

40. Swain, E.B., D.R. Engstrom, M.E. Brigham, T.A. Henning, and P.L. Brezonik. 1992. Increasing rates of atmospheric mercury deposition in midcontinental North America. Science 257:784-787.

41. Bergstrom, J.G.T. Mercury Behavior in Flue Gases. Waste Management and Research. 1986, 4:57-64

42. Pacyna, J.M. and Munch, J. Anthropogenic Mercury Emissions in Europe. Water and Soil Pollution. 1991, 56: 51-63.

43. WHO 1976. WHO Environmental Health Criteria 1: Mercury. World Health Organization. Geneva. 132 pp.

44. MeKeown-Eyssen, G.E. and Ruedy, J. 1983. Prevalence of neurological abnormality in Cree Indians exposed to methylmercury in northern Quebec. Clinical and Investigative Medicine 6:161-169.

45. Clarkson, T.W. 1987. Metal toxicity in the central nervous system. Environmental Health Perspectives 75:59-64.

46. Fitzgerald, W.F. and T.W. Clarkson. 1991. Mercury and monomethylmercury: present and future concerns. Environmental Health Perspectives 96:159-166.

47. WHO 1990. WHO Environmental Health Criteria 101: Methylmercury. World Health Organization. Geneva. 143 pp.

48. Fitzgerald, W.F. and T.W. Clarkson. 1991. Mercury and monomethylmercury: present and future concerns. Environmental Health Perspectives 96:159-166.

49. Marsh, D.O., T.W. Clarkson, C. Cox, G.J. Myers, L. Amin-Zaki, and S. Al- Tikriti. 1987. Fetal methylmercury poisoning: relationship between concentration in single strands of maternal hair and child effects. Archives of Neurology 118:470-479.

50. MDH 1993. Minnesota Fish Consumption Advisory. Minnesota Department of Health. Minneapolis. 72 pp.

51. Ensor, K.L., D.D. Helwig, L.C. Wemmer. Mercury and Lead in Minnesota Common Loons (Gavina immer). Minnesota Pollution Control Agency, Water Quality Division. April 1992.

52. Ensor, K.L., W.C. Pitt, and D.D. Helwig 1993. Contaminants in Minnesota Wildlife 1989-1991. Water Quality Division, Minnesota Pollution Agency. St. Paul, MN. 90 pp.

53. EPA, 1989 - TEF. EPA Risk Assessment Forum, "Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofuran (CDDs and CDFs) and 1989 Update" EPA/625/3089/016 March 1989. Part II, page 3 - 12

54. Czuczwa JM, Hites RA, McVeety, BD. "Polychlorinated dibenzo-p-dioxins and dibenzofurans in sediments from Siskiwit Lake, Isle Royale. Science, Vol. 226, pp 568-569, 1984.

55. Czuvzwa, JM, and Hites RA, Air Borne Dioxins and Dibenzofurans: Source and Fates. Environmental Science and Technology. Vol 20, pp 195-200, 1986.

56. Arthur, MF, and Frea, JI. 2378 Tetrachlorodibenzo-p-dioxin: Aspects of its important properties and its potential degradation in soils. J. Environ. Quality. 18,1-11. 1989.

57. Quensen, JF, and Matsumura, F. Oxidative degradation of 2378-Tetrachlorodibenzo-p-dioxins by microorganisms. Environmental Toxicology and Chemistry Vol 2, pp 261-268, 1983.

58. Agency for Toxic Substances and Disease Registry. Toxicological Profile for 2378 Tetrachlorodibenzo-p-dioxin. U.S. Public Health Service. ATSDR/TP-88/23. June 1989.

59. Fingerhut, Marilyn A, et. al., "Cancer Mortality in Workers Exposed to 2,3,7,8-Tetrachlorodibenzo-p-Dioxin" The New England Journal of Medicine, Vol. 324, No. 4, January 24, 1991.

60. Fingerhut, Marilyn A, et. al., "Cancer Mortality in Workers Exposed to 2,3,7,8-Tetrachlorodibenzo-p-Dioxin" The New England Journal of Medicine, Vol. 324, No. 4, January 24, 1991.

61. Chemical Regulation Reporter. "Background Contamination May Cause Adverse Effect, Say U. S., European Scientists" Bureau of National Affairs. Vol. 16, Number 50. March 19, 1993. pp. 2413-2414.

62. Travis, C. C. and Hattemer-Frey, H. "Human Exposure to Dioxin from Municipal Solid Waste Incineration". Waste Management. Vol. 9. pp. 151-156, 1989.

63. EPA, 1993. Interim Report on the Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risk to Aquatic Life and Associated Wildlife. Revised January 26, 1993. EPA/600/XXXX, January 1993. pp. ix.

64. EPA, 1993. Interim Report on the Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risk to Aquatic Life and Associated Wildlife. Revised January 26, 1993. EPA/600/XXXX, January 1993. pp. ix.

65. Mehrle, Paul M., Buckler, Denny, R., Little, Edward E., Smith, Larry M. Petty, Jim D., Peterman, Paul H., Stalling, David L., De Graeve, G. M., Coyle, James J. and Adams, William J. Toxicity and Bioconcentration of 2,3,7,8-Tetrachlorodibenzodioxin and 2,3,7,8-Tetrachlorodibenzofuran in Rainbow Trout. Environmental Toxicology and Chemistry, Vol. 7, pp. 47 - 62. 1988.

66. EPA, 1993. Interim Report on the Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risk to Aquatic Life and Associated Wildlife. Revised January 26, 1993. EPA/600/XXXX, January 1993. pp. xiii.

67. EPA, 1993. Interim Report on the Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risk to Aquatic Life and Associated Wildlife. Revised January 26, 1993. EPA/600/XXXX, January 1993. pp. xiii.

68. Fox, GA, and Weseloh, DV. Colonial Waterbirds as Bio-Indicators of Environmental Contamination in the Great Lakes. ICBP Technical Publication No. 6, 1987.

69. Peakall, DB, and Fox, GA. Toxicological investigations of Pollutant-Related Effect in Great Lakes Gulls. Environmental Health Perspectives Vol 71, 187-193..

70. Tillett, DE, et. al. Polychlorinated Biphenyl Residues and Egg Mortality in Double-Crested Cormorants From the Great Lakes. Environmental Toxicology and Chemistry, Vol. 11, pp 1281-1288, 1992.

71. Kubiak, TJ. et. al. Microcontaminants and Reproductive Impairment of the Forster's Tern on Green Bay, Lake Michigan-1983. Archives of Environmental Contamination and Toxicology Vol 18, pp 706-727, 1989.

72. Hoffman, DJ. et. al. Embryotoxicity, Teratogenicity, and Aryl Hydrocarbon Hydroxylase Activity in Forster's Terns on Green Bay, Michigan. Environmental Research, 42, 176-184, 1987.

73. Nosek, Tox. 1992. Nosek, JA et. al. Toxicity and Reproductive Effects on 2378 Tetrachlorodibenzo-p-dioxin in Ring-necked Pheasant Hens. Journal of Toxicology and Environmental Health Vol. 35, pp 187-198. 1992.

74. Nosek, Met. 1992. Nosek, JA. et. al. Metabolism and Disposition of 2378 Tetrachlorodibenzo-p-dioxin in ring-necked Pheasant Hens, Chicks, and Eggs. Journal of Toxicology and Environmental Health. Vol. 35. pp. 153-164. 1992.

75. Reinecke, A.J. and Nash, R.G. Toxicology of 2378 TCDD and Short-term Bioaccumulation of Earthworms (Oligocheta). Soil Bio. Biochem. Vol. 16, No. 1, pp 45-49, 1984.

76. Bumb, RR. et. al. Trace Chemistries of Fire: A source of Chlorinated Dioxins. Science, Vol 210, No. 4468, pp 385-390. October, 1980.

77. Crummett, W.B, and Townsend DI, "The Trace Chemistry of Fire Hypothesis: Review and Update" Chemosphere, Vol. 13. No. 7. pp 777-788, 1984.

78. Czuczwa JM, Hites RA, McVeety, BD. "Polychlorinated dibenzo-p-dioxins and dibenzofurans in sediments from Siskiwit Lake, Isle Royale. Science, Vol. 226, pp 568-569, 1984.

79. Czuvzwa, JM, and Hites RA, Air Borne Dioxins and Dibenzofurans: Source and Fates. Environmental Science and Technology. Vol 20, pp 195-200, 1986.

80. Altwicker, ER. et. al. 1990. Polychlorinated Dioxin/Furan Formation in Incinerators. Hazardous Waste and Hazardous Materials, Vol. 7, No. 1, Mary Ann Liebert, Inc. 1990. pp. 73

81. EPA 1987. Municipal Waste Combustion Study, Combustion Control of Organic Emissions. EPA/530-SW-87-021c. June 1987. pp. 47

82. Biewen, Todd. MPCA Memorandum to Lisa Thorvig, et al. "Hospital Incinerator Compliance Status Update" March 22, 1990.

83. Albers, Scott. Letter from Hennepin County to Louis Chamberlain, MPCA. February 2, 1988.

84. Valentine, J. Michael 1989. Memorandum to Joint Air Quality and Ground Water and Solid Waste Committee. "Summary of Incineration Survey" August 15, 1989.

85. MPCA, 1991. Report on the Assessment of Operation and Emissions of On-Site Medical Waste Incinerators. Minnesota Pollution Control Agency, Air Quality Division. December 1991. pp. 68.

86. Confuorto, Nicholas. "Dry Scrubbing System Shows Promise" Waste Age, Vol. 21, No. 11. November 1990.

87. Fredrickson, Linnea, Cathy Latham, Susan Mitchell, John Thomas. Minnesota Pollution Control Agency solid Waste Composition Study, 1990-1991 Part I. Presented to the Legislative Commission on Waste Management, November 1, 1992. Minnesota Pollution Control Agency. pp. 84 to 89.

88. EPA, 1990. AIRS Facility Subsystem Source Classification Codes and Emission Factor Listing for Criteria Air Pollutants, EPA-450/4-90-003, March 1990. pp. 104.

89. Kearney and Franklin. Characterization of Products Containing Mercury in Municipal Solid Waste in the United States, 1970 to 2000. Final Draft Deliverable. Submitted by A.T. Kearney, Inc., Alexandria, VA and Franklin Associates, Inc., Prairie Village, KS. January 1991. pp. 3.

90. Mineo, Ronald W. and Andrea Rosenthal, Parsons Brinckerhoff Quade and Douglas, Inc. "Start-Up and Testing of a Hospital Waste Incinerator" in Proceedings, Air and Waste Management Association 83rd Annual Meeting and Exhibition, Pittsburgh, Pennsylvania, June 24-29, 1990. Session 27, 90-27.1. pp. 10.

91. McFee, John. "Waste Characterization" Incineration Basics Course, 1989 Incineration Conference, May 2, 1989. Knoxville Tennessee. pp. 3.

92. Congress, Office of Technology Assessment, "Facing America's Trash: What Next for Municipal Solid Waste, OTA-O-424 (Washington, DC: U.S. Government Printing Office, October 1989). pp. 85

93. Valentine, J. Michael 1989. Memorandum to Joint Air Quality and Ground Water and Solid Waste Committee. "Summary of Incineration Survey" August 15, 1989.

94. Hocker, Christopher. "Inside Views of Plant Operations and Maintenance" Solid Waste and Power, Vol. IV, No. 2. April 1990. pp. 32.

95. Alam, Manzoor, and David J. Schlotthauer "Planning for Successful Ash Handling", Solid Waste and Power, Vol. IV, No. 4 August 1990. pp. 30.

96. EPA, 1989. "Characterization of Products Containing Lead and Cadmium in Municipal Solid Waste in the United States, 1970 to 2000" Prepared for USEPA by Franklin Associates, Ltd. EPA/530-SW-89-015A, January 1989. Chapter 1.

97. Rigo, H.G, A.J Chandler, S.E. Sawell. Debunking Some Myths About Metals. Presented at 1993 International Conference on Municipal Waste Combustion, Williamsburg, VA. March 30-April 2, 1993.

98. Fredrickson, Linnea, Cathy Latham, Susan Mitchell, John Thomas. Minnesota Pollution Control Agency solid Waste Composition Study, 1990-1991 Part I. Presented to the Legislative Commission on Waste Management, November 1, 1992. Minnesota Pollution Control Agency. pp. 55 to 56.

99. Helliwell, William E, HERC letter to Lisa J. Thorvig, September 30, 1991. Unprocessed Waste report.

100. Minnesota Office of Waste Management (OWM), 1990. Solid Waste Incinerator Ash Quantity and Toxicity Reduction Report, January 17, 1990. pp. 5.

101. Korzun, Edwin A. and Howell H. Heck, "Sources and Fates of Lead and Cadmium in Municipal Solid Waste" Journal of the Air and Waste Management Association, Vol 40 No. 6, September 1990. pp. 1222.

102. MPCA, 1991. Report on the Assessment of Operation and Emissions of On-Site Medical Waste Incinerators. Minnesota Pollution Control Agency, Air Quality Division. December 1991. pp. 27.

103. Mineo, Ronald W. and Andrea Rosenthal, Parsons Brinckerhoff Quade and Douglas, Inc. "Start-Up and Testing of a Hospital Waste Incinerator" in Proceedings, Air and Waste Management Association 83rd Annual Meeting and Exhibition, Pittsburgh, Pennsylvania, June 24-29, 1990. Session 27, 90-27.1. pp. 10.

104. Durkee, Kenneth, R. and Eddinger, James, A. Status of EPA Regulatory Program For Medical Waste Incinerators--Test Program and Characterization of Emissions. U. S. EPA, Research Triangle Park, North Carolina, 27711. Paper presented at 1991 Incineration Conference, May 13-17, 1991, Knoxville, TN.

105. EPA, 1990. Municipal Waste Combustion: Background Information for Promulgated Standards and Guidelines - Summary of Public Comments and Responses. EPA-450/3-91-004. November 1990. pp. 3-152.

106. MPCA, 1991. Report on the Assessment of Operation and Emissions of On-Site Medical Waste Incinerators. Minnesota Pollution Control Agency, Air Quality Division. December 1991. pp. 89.

107. Leavitt, Cristine and McCarron, Robert J. Minnesota Solid Waste Management, Selected Economic and Financial Issues. Presented to the Legislative Commission on Waste Management. July 1, 1992. pp. 1, figure 1.

108. PACE Labs, Results of the April 23-30, 1990 Criteria and Noncriteria Emission compliance Tests on the Nos. 1 and 2 incinerators at the Fergus Falls Waste to Energy Facility located in Fergus Falls, Minn. Aug 2, 1990. Table 30.

109. Twin City Testing, RDF Analysis for UPA, January 10, 1990.

110. EPA, 1990. AIRS Facility Subsystem Source Classification Codes and Emission Factor Listing for Criteria Air Pollutants, EPA-450/4-90-003, March 1990. pp. 21.

111. Singer, Joseph, ed. Combustion: Fossil Power Systems, Combustion Engineering, Inc. Windsor, CT. McGraw-Hill, 1981. pp. 2-23.

112. Tillman, David A, The Combustion of Solid Fuels and Wastes. Academic Press, Inc. San Diego, CA. 1991. pp. 39 to 42.

113. Barton, Robert G. and Seeker, Randall W. "Behavior of Metals in Medical Waste Incinerators", Proceedings, Air and Waste Management Association 83rd Annual Meeting and Exhibition, Pittsburgh, PA, June 24 - 29, 1990.

114. EPA 1989. Operation and Maintenance of Hospital Medical Waste Incinerators. EPA-450/3-89-002. March 1989. pp. 3-9.

115. Rizeq, George R.; Clark, Wyaman; and Seeker, Randall W. "Engineering Analysis of Metals Emissions From Hazardous Waste Incinerators", Proceedings, Air and Waste Management Association 85th Annual Meeting and Exhibition, Pittsburgh, PA, June 21 -26, 1992

116. Marklund, S.; Fangmark, I.; Rappe, C. Formation and Degradation of Chlorinated Aromatic Compounds in an Air Pollution Control Device for MSW Combustor. Chemosphere, Vol. 25, Nos. 1-2, pp. 139 to 142, 1992

117. Lerner, B.J. "Dioxin/Furan Removal: Negative Efficiency Behavior Causes and Effects", Proceedings, Air and Waste Management Association 85th Annual Meeting and Exhibition, Pittsburgh, PA, June 21 -26, 1992

118. Swain, a. Swain, Edward., ed. Assessment of Mercury Contamination in Selected Minnesota Lakes and Streams, Executive Summary, MPCA Report to the Legislative Commission on Minnesota Resources, 1989.

119. Swain, b. Swain, Edward B. and Daniel D. Helwig. "Mercury in Fish from Northeastern Minnesota Lakes: Historical Trends, Environmental Correlates, and Potential Sources" in Assessment of Mercury Contamination in Selected Minnesota Lakes and Streams. Ed. Edward Swain. MPCA report to the Legislative Commission on Minnesota Resources, 1989.

120. Ensor, K.L., D.D. Helwig, and L.C. Wemmer 1992. Mercury and Lead in Minnesota Common Loons (Gavia immer). Water Quality Division, Minnesota Pollution Control Agency. St. Paul, MN.

121. Kearney and Franklin. Characterization of Products Containing Mercury in Municipal Solid Waste in the United States, 1970 to 2000. Final Draft Deliverable. Submitted by A.T. Kearney, Inc., Alexandria, VA and Franklin Associates, Inc., Prairie Village, KS. January 1991. pp. 1 to 12.

122. Kearney and Franklin. Characterization of Products Containing Mercury in Municipal Solid Waste in the United States, 1970 to 2000. Final Draft Deliverable. Submitted by A.T. Kearney, Inc., Alexandria, VA and Franklin Associates, Inc., Prairie Village, KS. January 1991. pp. 1 to 12.

123. Rigo, H.G., AJ Chandler, SE Sawell, "Debunking Some Myths About Metals" Presented at the Third International Municipal Waste Combustor Conference, March 30 to April 2, 1993. Williamsburg, VA.

124. Rugg, M. and N.K. Hanna, "Mercury Concentrations in Municipal Solid Waste Components in Cape May County, New Jersey" Proceedings, SWANA's Sixth Annual Waste-to-Energy Symposium, January 28 -30, 1992. SWANA, GR-WTE-0007. pp. 193 to 198.

125. EPA. Characterization of Municipal Solid Waste in the United States: 1990 Update; EPA/530-SW-90-042 June 1990. pp. 10, table 1.

126. White, David M. and Jackson, Anne M. "The Potential of Materials Separation as a Control Technique for Compliance with Mercury Emissions Limits" Proceedings, Third International Conference, Municipal Waste Combustion, Williamsburg, VA. March 30 - April 2, 1993.

127. White, David M. and Jackson, Anne M. "The Potential of Materials Separation as a Control Technique for Compliance with Mercury Emissions Limits" Proceedings, Third International Conference, Municipal Waste Combustion, Williamsburg, VA. March 30 - April 2, 1993.

128. White, David M. and Jackson, Anne M. "The Potential of Materials Separation as a Control Technique for Compliance with Mercury Emissions Limits" Proceedings, Third International Conference, Municipal Waste Combustion, Williamsburg, VA. March 30 - April 2, 1993.

129. White, David M. and Jackson, Anne M. "The Potential of Materials Separation as a Control Technique for Compliance with Mercury Emissions Limits" Proceedings, Third International Conference, Municipal Waste Combustion, Williamsburg, VA. March 30 - April 2, 1993.

130. White, David M. and Jackson, Anne M. "The Potential of Materials Separation as a Control Technique for Compliance with Mercury Emissions Limits" Proceedings, Third International Conference, Municipal Waste Combustion, Williamsburg, VA. March 30 - April 2, 1993.

131. White, David M., Nebel, Kristina A., and Brna, Theodore G. et. al. "Parametric Evaluation of Powdered Activated Carbon Injection for Control of Mercury Emissions from a Municipal Waste Combustor", Proceedings, Air and Waste Management Association 85th Annual Meeting and Exhibition, Pittsburgh, PA, June 21 -26, 1992

132. White, David M., Nebel, Kristina A., and Brna, Theodore G. et. al. "Parametric Evaluation of Powdered Activated Carbon Injection for Control of Mercury Emissions from a Municipal Waste Combustor", Proceedings, Air and Waste Management Association 85th Annual Meeting and Exhibition, Pittsburgh, PA, June 21 -26, 1992

133. White, David M., Nebel, Kristina A., and Brna, Theodore G. et. al. "Parametric Evaluation of Powdered Activated Carbon Injection for Control of Mercury Emissions from a Municipal Waste Combustor", Proceedings, Air and Waste Management Association 85th Annual Meeting and Exhibition, Pittsburgh, PA, June 21 -26, 1992

134. EPA, 1991. Control Technologies for Hazardous Air Pollutants. EPA/625/6-91/014, June 1991. pp. 3-5.

135. EPA, 1991. Control Technologies for Hazardous Air Pollutants. EPA/625/6-91/014, June 1991. pp. 3-7.

136. Marklund, S.; Fangmark, I.; Rappe, C. Formation and Degradation of Chlorinated Aromatic Compounds in an Air Pollution Control Device for MSW Combustor. Chemosphere, Vol. 25, Nos. 1-2, pp. 139 to 142, 1992

137. Lerner, B.J. "Dioxin/Furan Removal: Negative Efficiency Behavior Causes and Effects", Proceedings, Air and Waste Management Association 85th Annual Meeting and Exhibition, Pittsburgh, PA, June 21 -26, 1992

138. Shabat and Studley, "Reducing Mercury Emissions from Municipal Solid Waste Combustion" in Proceedings, 1st Annual North American Waste-to-Energy Conference, April 1993. SWANA Publ. #GR-WTE 0101

139. EPA, 1989. Municipal Waste Combustors-Background Information for Proposed Standards: Post-Combustion Technology Performance. EPA-450/3-89-27c. August, 1989. P. 7-59

140. Minnesota Resource Recovery Association. Cost Analysis-Proposed Waste Combustor Rulemaking. Prepared by Camp, Dresser & McKee, Inc. August 20, 1989. Appendix I, Table 1.

141. Minnesota Resource Recovery Association. Cost Analysis-Proposed Waste Combustor Rulemaking. Prepared by Camp, Dresser & McKee, Inc. August 20, 1989. Appendix I, Table 1.

142. Leavitt, Cristine and McCarron, Robert J. Minnesota Solid Waste Management, Selected Economic and Financial Issues. Presented to the Legislative Commission on Waste Management. July 1, 1992.

143. Leavitt, Cristine and McCarron, Robert J. Minnesota Solid Waste Management, Selected Economic and Financial Issues. Presented to the Legislative Commission on Waste Management. July 1, 1992. pp. 2.

144. USEPA Municipal Waste Combustors-Background Information for Proposed Guidelines for Existing Facilities, EPA-450/3-89-027e, August 1989,

145. Kiser, "Municipal Waste Combustion in North America: 1992 Update" Status of Municipal Waste combustion in the United States: 1992 Update, ISWA, 1992

146. Minnesota Solid Waste Composition Study, 1991-1992 Part II Minnesota Pollution Control Agency , St. Paul, Minnesota. April 1998. pp. 10.

147. Gates, Betsy; Latham, Cathy; Nelson, Wayne; and Washington, Darrell. Non-Mixed Municipal Solid Waste Composition and Volume, Metropolitan Area, 1990-1991, Minnesota Pollution Control Agency ,and Metropolitan Council April 1993. p. 20.

148. USEPA, Science Advisory Board. Report of the Products of Incomplete Combustion Subcommittee of the Science Advisory Board, Review of OSW Proposed Controls For Hazardous Waste Incineration Products of Incomplete Combustion. EPA-SAB-EC-90-004, January, 1990 p. 14.

149. USEPA, Minimization and Control of Hazardous Combustion Byproducts, EPA/600/s2-90/039. August, 1990 p. 152

150. Lerner, 1993. Mercury Emission Control in Medical Waste Incineration. Paper No. 93-MP-21.05 Presented at the Air and Waste Management Association 86th Annual Meeting and Exhibition, Denver, CO. June 13-18, 1993

151. Steiner, N. Heavy Metal Removal from Flue Gas Scrubber Water of Garbage Incinerators with TMT. Paper No. 93-RP-154.02. Presented at 86th Annual Meeting, Air and Waste Management Association, Denver CO. June 13-18, 1993.

152. USEPA, AIRS Facilities Subsystem Source Classification Codes and Emission Factor Listing for Criteria Air Pollutants, EPA 450/4-90-003, March 1990. p. 104

153. PACE 1990. Results of the November 16 and 17, 1989 Particulate and Metals Emission Compliance Test on the Assay and Film Negative Furnaces at the Enviro-Chem, Inc. Facility Located in Rogers, Minnesota. February 2, 1990

154. Cooper, C. David and F.C. Alley. Air Pollution Control A Design Approach. Waveland Press, Inc. Prospect Heights, Illinois. 1986. pp. 539 to 550.

155. Platt, Melvin. Worthington Regional Hospital. Letters to MPCA, January 6, 1993.

156. Platt, Melvin. Worthington Regional Hospital. Letters to MPCA, February 10, 1993.

157. Vold, Hank. North Country Regional Hospital, Bemidji. Letter to MPCA, February 10, 1993.

158. Singer, Joseph G. ed. Combustion, Fossil Power Systems, A Reference Book on Fuel Burning and Steam Generation, Third Edition. Combustion Engineering, Inc. Windsor, CT. 1981. pp. 17-68

159. Hocker, Christopher. "Inside Views of Plant Operations and Maintenance" Solid Waste and Power, Vol. IV, No. 2. April 1990. pp. 36.

160. Durkee, Kenneth, R. and Eddinger, James, A. Status of EPA Regulatory Program For Medical Waste Incinerators--Test Program and Characterization of Emissions. U. S. EPA, Research Triangle Park, North Carolina, 27711. Paper presented at 1991 Incineration Conference, May 13-17, 1991, Knoxville, TN. pp. 423.

161. Lanier. Good Combustion Practices for MWC Facilities: PM Control Device Inlet Temperature Requirement, W.S. Lanier and T.R. von Alten, Energy and Environmental Research Corporation, 3622 Parkway, Suite 5006, Durham, NC 27707 EPA Contract No. 68-03-3365. pp. 2 to 3.

162. Lanier. Good Combustion Practices for MWC Facilities: PM Control Device Inlet Temperature Requirement, W.S. Lanier and T.R. von Alten, Energy and Environmental Research Corporation, 3622 Parkway, Suite 5006, Durham, NC 27707 EPA Contract No. 68-03-3365. pp. 10.

163. EER. Lanier, W.S. and von Alten, T.R. Good combustion Practice For MWC Facilities: Start-up and Shutdown. Energy and Environmental Research Corp. 3622 Lychan Pkwy, Suite 5006, Durham, NC, November 1990. pp. 1

164. EER. Lanier, W.S. and von Alten, T.R. Good combustion Practice For MWC Facilities: Start-up and Shutdown. Energy and Environmental Research Corp. 3622 Lychan Pkwy, Suite 5006, Durham, NC, November 1990. pp. 1 to 3.

165. EER. Lanier, W.S. and von Alten, T.R. Good combustion Practice For MWC Facilities: Start-up and Shutdown. Energy and Environmental Research Corp. 3622 Lychan Pkwy, Suite 5006, Durham, NC, November 1990. pp. 3 to 6.

166. Agrawal, S.R. and von Alten, T.R. Good Combustion Practice For MWC Facilities: Maximum Steam Load Requirement. Energy and Environmental Research Corporation, 3622 Lychan Parkway, Suite 5006, Durham NC, November 1990. pp. 1 to 2.

167. Agrawal, S.R. and von Alten, T.R. Good Combustion Practice For MWC Facilities: Maximum Steam Load Requirement. Energy and Environmental Research Corporation, 3622 Lychan Parkway, Suite 5006, Durham NC, November 1990. pp. 3 to 4.

168. Lee, C.C. "A Model Analysis of Metal Partitioning" Journal of Air Pollution Control Association, Vol. 38, No. 7, July 1988. pp. 941.

169. Sills, Robert D, ed. Mercury in Michigan's Environment, Causes and Extent of the Problem, June 24, 1992 Draft. Michigan Department of Natural Resources. pp. 12.

170. Kearney and Franklin. Characterization of Products Containing Mercury in Municipal Solid Waste in the United States, 1970 to 2000. Final Draft Deliverable. Submitted by A.T. Kearney, Inc., Alexandria, VA and Franklin Associates, Inc., Prairie Village, KS. January 1991. pp. 4.

171. EPA, 1990. Guides to Pollution Prevention Selected Hospital Waste Streams EPA/625/7-90/009 January 1990. pp. 6.

172. EPA, 1990. Guides to Pollution Prevention Selected Hospital Waste Streams EPA/625/7-90/009 January 1990. pp. 6.

173. Sills, Robert D, ed. Mercury in Michigan's Environment, Causes and Extent of the Problem, June 24, 1992 Draft. Michigan Department of Natural Resources. pp. 12.

174. EPA, 1989. Municipal waste combustion Assessment: Technical Basis for Good Combustion Practice. EPA-600/8-89-063. August 1989. pp. 2-1 to 2-3.

175. Lanier. Good Combustion Practices for MWC Facilities: PM Control Device Inlet Temperature Requirement, W.S. Lanier and T.R. von Alten, Energy and Environmental Research Corporation, 3622 Parkway, Suite 5006, Durham, NC 27707 EPA Contract No. 68-03-3365. pp. 2 to 3.

176. EPA, 1990a. Municipal Waste Combustion: Background Information for Promulgated Standards and Guidelines - Summary of Public Comments and Responses. EPA-450/3-91-004. November 1990. pp. 3-138.

177. EPA, 1990a. Municipal Waste Combustion: Background Information for Promulgated Standards and Guidelines - Summary of Public Comments and Responses. EPA-450/3-91-004. November 1990. pp. 3-56 to 3-58.

178. EPA, 1990a. Municipal Waste Combustion: Background Information for Promulgated Standards and Guidelines - Summary of Public Comments and Responses. EPA-450/3-91-004. November 1990. pp. 3-53 to 3-56

179. EPA, 1990b. Municipal Waste Combustion: Background Information for Promulgated Standards and Guidelines - Summary of Public Comments and Responses Appendices A to C. EPA-450/3-91-004. December 1990. pp. A1-1 to A1-4.

180. Ross, Brian Letter from Brian Ross of Campbell-Sevey, Inc., to Marion Kloster of Minnesota Pollution Control Agency. January 14, 1992.

181. Agrawal, S.R. and von Alten, T.R. Good Combustion Practice For MWC Facilities: Maximum Steam Load Requirement. Energy and Environmental Research Corporation, 3622 Lychan Parkway, Suite 5006, Durham NC, November 1990. pp. 1 to 2.

182. Pellinger, Barry, Philip H. Taylor and Debra A. Tirey. Minimization and Control of Hazardous Combustion Byproducts. EPA/600/52-90/039 August 1990. pp. 152 to 162

183. Lanier. Good Combustion Practices for MWC Facilities: PM Control Device Inlet Temperature Requirement, W.S. Lanier and T.R. von Alten, Energy and Environmental Research Corporation, 3622 Parkway, Suite 5006, Durham, NC 27707 EPA Contract No. 68-03-3365. pp. 3 to 10

184. MPCA, 1991. Report on the Assessment of Operation and Emissions of On-Site Medical Waste Incinerators. Minnesota Pollution Control Agency, Air Quality Division. December 1991. pp. 64.

185. EPA, 1990a. Municipal Waste Combustion: Background Information for Promulgated Standards and Guidelines - Summary of Public Comments and Responses. EPA-450/3-91-004. November 1990. pp. 3-127 to 3-128.

186. EPA, August 1989. Municipal Waste Combustion Assessment: Technical Basis For Good Combustion Practice, EPA-600/8-89-063 August 1989. pp. 2-7.

187. EPA, 1989. Municipal Waste Combustors--Background Information for Proposed Standards: Cost Procedures, EPA-450/3-89-27a, August 14, 1989.

188. EPA, 1989. Municipal Waste Combustors--Background Information for Proposed Standards: 111(b) Model Plant Descriptions and Cost Report, EPA-450/3-89-27b, August 14, 1989.

189. OAQPS Control Cost Manual, Fourth Edition. EPA 450/3-90-006 January 1990.

190. ICF. Kaiser. Technical Work Paper for the MPCA, Particulate And Dioxin/Furan Air Pollution Control Techniques for Class III Modular Incinerators. ICF Kaiser Engineers, Inc. Pittsburgh, Pennsylvania 15222 April 1993.

191. Methodology, Data Base, and Detailed Estimates, Management Information Services, Inc., 1986. pp. 7

192. Minnesota Department of Health, 1990 Hospital Revenue & Expense Report.

D. LIST OF WITNESSES

In support of the need and reasonableness of the proposed rules, the following witnesses, all MPCA staff will testify at any hearing that may take place in regard to these proposed rules:

1. Anne Jackson, Air Quality Division. Ms. Jackson will testify on the general need for, and the reasonableness of the proposed rules.

2. Mike Mondloch, Air Quality Division. Mr. Mondloch will be available to testify on the general need for and the reasonableness of the proposed rules. In particular, Mr. Mondloch will testify on the development of cost estimates for municipal waste and onsite waste combustors.

3. Robert McCarron, Air Quality Division. Mr. McCarron will testify on the development of the economic impacts of the proposed rule.

4. Marion Kloster, Air Quality Division. Mr. Kloster will be available to testify on the development of cost estimates for municipal waste combustors.

5. Peter Torkelson, Air Quality Divison. Mr. Torkelson will be available to testify on the operation of medical waste incinerators, their emissions, and permitting of hospital incinerators. He will also be available to testify on the training of waste combustor personnel and the operator certification process.

6. Edward Swain, Air Quality Division. Dr. Swain will be available to testify on the environmental impacts of mercury emissions.

7. Gregory Pratt, Air Quality Division. Dr. Pratt will be available to testify on the computer modelling of air emissions from stacks, stack height, and the dispersion of pollutants.

8. Susan Mitchell, Air Quality Division. Ms. Mitchell will be available to testify on the conduct of the MPCA's municipal waste composition study, and the study's results.

9. Paul Gerbec, Air Quality Division. Mr. Gerbec will be available to testify on the emissions of air toxics, the conduct of risk assessments, and the regulation of hazardous air pollutants.

10. Sheryll Livingstone, Air Quality Division. Ms. Livingstone will be available to testify on the ecological and human health effects of dioxins.

11. Todd Biewen, Air Quality Division. Mr. Biewen will be available to testify on the operation of waste combustors, and the operation of continuous emission monitors.

12. Lisa Thorvig, Air Quality Divison. Ms. Thorvig will be available to testify on the general need for and the reasonableness of the proposed rules. In particular, she will testify on MPCA's air quality permitting policies, including waste combustors and other solid waste treatment facilities that require air emission permits.

13. Michael Sandusky, Air Quality Division. Mr. Sandusky will be available to testify on the enforcement resource issues for the Air Quality Division of the proposed rule.

14. Laurel Mezner, Administrative Services Division. Ms. Mezner will be available to testify on the general need for and reasonableness of the proposed rules as they relate to medical waste combustors and the management of infectious waste.

15. Julie Ketchum, Ground Water and Solid Waste Division. Ms. Ketchum will be available to testify on the impacts to solid waste management in Minnesota from the proposed rules.

16. Patrick Carey, Hazardous Waste Division. Mr. Carey will be available to testify on the requirements of mercury waste management of the proposed rules.

The MPCA will also offer the testimony of witnesses from outside the MPCA to testify in support of the proposed rules, as follows:

1. Ginny Black, Minnesota Office of Waste Management. Ms. Black will testify on the general need for and reasonableness of the proposed rules. In particular, she will testify on the impacts of the proposed rules on municipal waste management practices in Minnesota.

2. David White, Radian Corporation. Mr. White will testify on the reasonableness of the standards of performance, in particular the characterization, measurement and control of mercury emissions from waste combustors.

Appendix 1

Standards of Performance for Incinerators
Minnesota Rules 7011.1201 to 7011.1207
(7005.0600 to 7005.0650)

STANDARDS OF PERFORMANCE FOR INCINERATORS

7005.0600 DEFINITIONS.

Subpart 1. Scope. As used in parts 7005.0600 to 7005.0650 the following words shall have the meanings defined herein.

Subp. 2. Incinerator. "Incinerator" means any furnace or other device used in the process of burning solid waste for the purpose of reducing the volume of the waste by removing combustible matter.

Subp. 3. Solid waste. "Solid waste" means garbage, refuse, and other discarded solid materials, except animal waste used as fertilizer, including solid waste materials resulting from industrial, commercial, and agricultural operations, and from community activities. Solid waste does not include earthen fill, boulders, rock, and other materials normally handled in construction operations, solids or dissolved material in domestic sewage, or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial waste water effluents, dissolved materials in irrigation return flows, or other common water pollutants.

Subp. 4. Burning capacity. "Burning capacity" means the manufacturer's or designer's maximum rate or such other rate that is considered good engineering practice and accepted by the commissioner.

MS s 116.07 subd 4

L 1987 c 186 s 15

7005.0610 STANDARDS OF PERFORMANCE FOR EXISTING INCINERATORS.

Subpart 1. Maximum particulate matter; capacity less than 200 pounds per hour. No owner or operator of an existing incinerator with a maximum refuse burning capacity of less than 200 pounds per hour shall cause to be discharged into the atmosphere from the incinerator any gases which contain particulate matter in excess of 0.3 gr/dscf corrected to 12 percent CO_2.

Subp. 2. Capacity of 200 to 2,000 pounds per hour. No owner or operator of an existing incinerator with a maximum refuse burning capacity of 200 to 2,000 pounds per hour shall cause to be discharged into the atmosphere from the incinerator any gases which contain particulate matter in excess of 0.2 gr/dscf corrected to 12 percent CO_2.

Subp. 3. Capacity of more than 2,000 pounds per hour. No owner or operator of an existing incinerator with a maximum refuse burning capacity of more than 2,000 pounds per hour shall cause to be discharged into the atmosphere from the incinerator any gases which contain particulate matter in excess of 0.1 gr/dscf corrected to 12 percent CO_2.

Subp. 4. Opacity. No owner or operator of an existing incinerator of any burning capacity shall cause or permit the emission of smoke or any other air contaminant which is greater than 20 percent opacity, except that a maximum of 40 percent opacity shall be permissible for four minutes in any 60-minute period.

Subp. 5. Requirements for afterburner. No owner or operator of an existing incinerator of any burning capacity shall burn type 2, 3, 4, 5, or 6 waste as classified by the Incinerator Institute of America unless said incinerator utilizes auxiliary fuel burners that maintain a minimum temperature of 1,200 degrees Fahrenheit for a minimum retention time of 0.3 second.

MS s 116.07 subd 4

7005.0620 STANDARDS OF PERFORMANCE FOR NEW INCINERATORS.

Subpart 1. Capacity less than 200 pounds per hour. No owner or operator of a new incinerator with a maximum refuse burning capacity of less than 200 pounds per hour shall cause to be discharged into the atmosphere from the incinerator any gases which contain particulate matter in excess of 0.2 gr/dscf corrected to 12 percent CO_2.

Subp. 2. Capacity of 200 to 2,000 pounds per hour. No owner or operator of a new incinerator with a maximum refuse burning capacity of 200 to 2,000 pounds per hour shall cause to be discharged into the atmosphere from the incinerator any gases which contain particulate matter in excess of 0.15 gr/dscf corrected to 12 percent CO_2.

Subp. 3. Capacity of 2,001 to 3,999 pounds per hour. No owner or operator of a new incinerator with a maximum refuse burning capacity of more than 2,000 but less than 4,000 pounds per hour shall cause to be discharged into the atmosphere from the incinerator any gases which contain particulate matter in excess of 0.1 gr/dscf corrected to 12 percent CO_2.

Subp. 4. Capacity greater than 4,000 pounds per hour. No owner or operator of a new incinerator with a maximum refuse burning capacity of 4,000 pounds per hour or more shall cause to be discharged into the atmosphere from the incinerator any gases which contain particulate matter in excess of 0.08 gr/dscf corrected to 12 percent CO_2.

Subp. 5. Opacity. No owner or operator of a new incinerator of any burning capacity shall cause or permit the emission of smoke or any other contaminant which is greater than 20 percent opacity.

Subp. 6. Requirements for afterburner. No owner or operator of a new incinerator of any burning capacity shall burn type 2, 3, 4, 5, or 6 waste as classified by the Incinerator Institute of America unless said incinerator utilizes auxiliary fuel burners that maintain a minimum temperature of 1,200 degrees Fahrenheit for a minimum retention time of 0.3 second.

MS s 116.07 subd 4

7005.0630 MONITORING OF OPERATIONS.

The owner or operator of any incinerator shall record the daily charging rate and hours of operation.

MS s 116.07 subd 4

7005.0640 PERFORMANCE TEST METHODS.

Unless another method is approved by the agency, any owner or operator required to submit performance tests for an incinerator shall utilize the following methods (defined in part 7005.0100):

A. Method 5 for the concentration of particulate matter and the associated moisture content;

B. Method 1 for sample and velocity traverses;

C. Method 2 for velocity and volumetric flow rate;

D. Method 3 for gas analysis and calculation of excess air, using the integrated sample technique; and

E. Method 9 for visual determination of opacity.

MS s 116.07 subd 4

7005.0650 PERFORMANCE TEST PROCEDURES.

Subpart 1. Method 5. For Method 5, the sampling time for each run shall be at least 60 minutes and the minimum sample volume shall be 0.85 dscm (30.0 dscf) except that smaller sampling times or sample volumes, when necessitated by process variables or other factors, may be approved by the agency.

Subp. 2. Wet scrubber. If a wet scrubber is used, the gas analysis sample shall reflect flue gas conditions after the scrubber, allowing for carbon dioxide absorption by sampling the gas on the scrubber inlet and outlet sides according to the following procedure:

A. The outlet sampling site shall be the same as for the particulate matter measurement. The inlet site shall be selected according to Method 1, or as specified by the agency.

B. Randomly select nine sampling points within the cross section at both the inlet and outlet sampling sites. Use the first set of three for the first run, the second set for the second run, and the third set for the third run.

C. Simultaneously with each particulate matter run, extract and analyze for CO_2 an integrated gas sample according to Method 3, traversing the three sample points and sampling at each point for equal increments of time. Conduct the runs at both inlet and outlet sampling sites.

D. Measure the volumetric flow rate at the inlet during each particulate matter run according to Method 2, using the full number of traverse points. For the inlet make two full velocity traverses approximately one hour apart during each run and average the results. The outlet volumetric flow rate may be determined from the particulate matter run (Method 5).

E. Calculate the adjusted CO_2 percentage using the following equation:

$$(\%CO_2)\ adj = (\%CO_2)\ di\ (Qdi/Qdo)$$

where:

$(\%CO_2)$ adj is the adjusted CO_2 percentage which removes the effect of CO_2 absorption and dilution air;

($\%CO_2$) di is the percentage of CO_2 measured before the scrubber, dry basis;

Qdi is the volumetric flow rate before the scrubber, average of two runs, dscf/min using Method 2; and

Qdo is the volumetric flow rate after the scrubber, dscf/min using Methods 2 and 5.

Subp. 3. Alternate procedures. The following procedures may be substituted for the procedures under items C to E:

A. Simultaneously with each particulate matter run, extract and analyze for CO_2, O_2, and N_2 an integrated gas sample according to Method 3, traversing the three sample points and sampling for equal increments of time at each point. Conduct the runs at both the inlet and outlet sampling sites.

B. After completing the analysis of the gas sample, calculate the percentage of excess air (EA) for both the inlet and outlet sampling sites using the following equation:

$$\%EA = \frac{(\%O_2) - 0.5(\%CO)}{0.264(\%N_2) - (\%O_2) + 0.5(\%CO)} \times 100$$

where:

%EA = percent excess air

$\%O_2$ = percent oxygen by volume, dry basis

$\%N_2$ = percent nitrogen by volume, dry basis

%CO = percent carbon monoxide volume, dry basis

0.264 = ratio of oxygen to nitrogen in air by volume

C. Calculate the adjusted CO_2 percentage using the following equation:

$$(\%CO_2)\ adj = (\%CO_2)\ di\ \frac{100 + (\%EA)_1}{100 + (\%EA)_0}$$

where:

($\%CO_2$) adj is the adjusted outlet CO_2 percentage;

($\%CO_2$) di is the percentage of CO_2 measured before the scrubber, dry basis;

$(\%EA)_1$ is the percentage of excess air at the inlet; and

$(\%EA)_0$ is the percentage of excess air at the outlet.

Subp. 4. Particulate matter. Particulate matter emissions, expressed in g/dscm, shall be corrected to 12 percent CO_2 by using the following formula:

$$c_{12} = \frac{12c}{\%CO_2}$$

where:

c_{12} is the concentration of particulate matter corrected to 12 percent CO_2;

c is the concentration of particulate matter as measured by Method 5; and

$\%CO_2$ is the percentage of CO_2 as measured by Method 3, or when applicable, the adjusted outlet CO_2 percentage as determined by subpart 2 or 3.

Appendix 2

Estimate of Actual Emissions from Waste Combustors in Minnesota

Table 1
Class A & B Waste Combustor's Actual Emissions
All Emissions @ 7% O2

Mercury Emissions

Facility	Actual Capacity 1990	Avg. Emis ug/dscm	Actual Emissions lb
NSP-Red Wing	177,000	32.58	56.16
NSP-Wilmarth	143,000	2.6	3.62
UPA	255,000	2.28	5.66
HERC	365,000	90.5	304.14
Sum	940,000		369.59

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (.028 dscm/dscf) * (g/10E6 ug) * (lb/454 g) * (2000 lb/ton) * (CONC ug/dscm) * (TPY RDF)
For Mass Burn Plants: (RDF PTE) * (5200/5500)

PM emissions

Facility	Actual Capacity 1990	Avg. Emis, gr/dscf	Actual Emissions tons
NSP-Red Wing	177,000	0.0541	108.11
NSP-Wilmarth	143,000	0.015	24.22
UPA	255,000	0.012	34.55
HERC	365,000	0.0014	5.45
Sum			172.32

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (lb/7000 gr) * (CONC gr/dscf) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Dioxins Emissions

Facility	Actual Capacity 1990	Avg. Emis, ng/dscm	Actual emissions, grams
NSP-Red Wing	177,000	28.96	23.09
NSP-Wilmarth	143,000	0.8	0.52
UPA	255,000	7.23	8.30
HERC	365,000	3	4.66
Sum, grams per year			36.57

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (.028 dscm/dscf) * (g/10E9 ng) * (2000 lb/ton) * (CONC ng/dscm) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Table 1 (continued)

Sulfur Dioxides

Facility	Actual Capacity 1990	Avg. Emis, ppm	Actual Emissions, toms
NSP-Red Wing	177,000	*	273*
NSP-Wilmarth	143,000	*	211*
UPA	255,000	*	662*
HERC	365,000	*	14*
Sum, tons per year			1160*

* 1991 Minnesota Emissions Inventory Pollution Summary Report.

Hydrogen Chloride

Facility	Actual Capacity1990	Avg. Emis, ppm	Actual Emissions, tons
NSP-Red Wing	177,000	402	510.71
NSP-Wilmarth	143,000	7.8	8.01
UPA	255,000	17	31.11
HERC	365,000	3.8	9.41
Sum, tons per year			559.24

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3/10E6 Btu) * (5500 Btu/lb) * (21/14) * (lb-mole/385 dscf) * (35 lbs/lb-mol HCl) * (PPM HCl/10E6) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Table 1A

Class A & B Waste Combustor's Potential Emissions w/ proposed Standards

All Emissions @ 7% O2

Mercury Emissions

Facility	Capacity	Avg. Emis ug/dscm	Pot. Emissions lb
NSP-Red Wing	181,400	30	53.00
NSP-Wilmarth	181,400	30	53.00
UPA	325,000	30	94.95
HERC	365,000	60	201.64
Sum	1,052,800		402.59

PM emissions

Facility	Capacity	Avg. Emis, gr/dscf	Pot. Emissions tons
NSP-Red Wing	181,400	0.02	40.96
NSP-Wilmarth	181,400	0.02	40.96
UPA	325,000	0.02	73.38
HERC	365,000	0.02	77.92
Sum	1,052,800		233.22

Dioxins Emissions

Facility	Capacity	Avg. Emis, ng/dscm	Pot. Emissions, grams
NSP-Red Wing	181,400	30	24.51
NSP-Wilmarth	181,400	30	24.51
UPA	325,000	30	43.92
HERC	365,000	30	46.63
Sum, grams per year			139.58

Table 1A (continued)

Sulfur Dioxides

Facility	Capacity	70% Removal	Pot. Emissions, tons
NSP-Red Wing	181,400	60	142.85
NSP-Wilmarth	181,400	60	142.85
UPA	325,000	60	255.93
HERC*	365,000	22.5	81.31
Sum, tons per year			622.94

*Under NSR, HERC SO2 emissions limited to 22.5 lbs/hr

Hydrogen Chloride

Facility	Capacity	90 % Removal	Pot. Emissions, tons
NSP-Red Wing	181,400	60	78.12
NSP-Wilmarth	181,400	60	78.12
UPA	325,000	60	139.96
HERC	365,000	60	148.61
Sum, tons per year			444.81

Table 1B

Class A & B Waste Combustor's Baseline Potential Emissions, existing conditions

All Emissions @ 7% O2

Mercury Emissions

Facility	Capacity	Emis ug/dscm	Pot. Emissions lb
NSP-Red Wing	181,400	200	353.32
NSP-Wilmarth	181,400	30	53.00
UPA	325,000	30	94.95
HERC	365,000	0.002	730.00
Sum	1,052,800		1231.27

PM emissions

Facility	Capacity	Emis, gr/dscf	Pot. Emissions tons
NSP-Red Wing	181,400	0.1	204.79
NSP-Wilmarth	181,400	0.02	40.96
UPA	325,000	0.02	73.38
HERC	365,000	0.02	77.92
Sum, tons per year	1,052,800		397.05

Dioxins Emissions

Facility	Capacity	Emis, Total ng/dscm	Pot. Emissions, grams
NSP-Red Wing	181,400	500	408.56
NSP-Wilmarth	181,400	130	106.23
UPA	325,000	390	570.95
HERC	365,000	250	388.62
Sum, grams per year	1,052,800		1474.34

Table 1B (continued)

Sulfur Dioxides

Facility	Capacity	Baseline ppm	Pot. Emissions, tons
NSP-Red Wing	181,400	200	476.16
NSP-Wilmarth	181,400	100	238.08
UPA	325,000	100	426.55
HERC*	365,000	22.5	81.31
Sum, tons per year	1,052,800		1222.10

*Under NSR, HERC SO2 emissions limited to 22.5 lbs/hr

Hydrogen Chloride

Facility	Capacity	Baseline ppm	Pot. Emissions, tons
NSP-Red Wing	181,400	600	781.20
NSP-Wilmarth	181,400	60	78.12
UPA	325,000	60	139.96
HERC	365,000	60	157.19
Sum, tons per year	1,052,800		1156.47

Table 2
Class C Waste Combustor's 1990 Actual Emissions
All Emissions @ 7% O2

Mercury Emissions

Facility	Actual Capacity 1990	Avg. Emis ug/dscm	Actual Emissions lb
WLSSD	33,000	75.6	24.30
City of Red Wing	18,000	923	152.97
Richards Asphalt	24,000	1407	310.92
Olmsted Co.	59,000	375	203.71
Quadrant	29,000	311	83.04
Pope-Douglas	18,000	132	21.88
Fergus Falls	27,200	25	6.26
Polk Co.	28,000	396	102.09
Sum	236,200		905.17

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (.028 dscm/dscf) * (g/10E6 ug) * (lb/454 g) * (2000 lb/ton) * (CONC ug/dscm) * (TPY RDF)
For Mass Burn Plants: (RDF PTE) * (5200/5500)

PM emissions

Facility	Actual Capacity 1990	Avg. Emis, gr/dscf	Actual Emissions, tons
WLSSD	33,000	0.005	1.86
City of Red Wing	18,000	0.014	2.69
Richards Asphalt	24,000	0.039	9.99
Olmsted Co.	59,000	0.019	11.97
Quadrant	29,000	0.032	9.91
Pope-Douglas	18,000	0.054	10.37
Fergus Falls	27,200	0.045	13.06
Polk Co.	28,000	0.031	9.26
Sum			69.12

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (lb/7000 gr) * (CONC gr/dscf) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Dioxins Emissions

Facility	Actual Capacity 1990	Avg. Emis, ng/dscm	Actual emissions, grams
WLSSD	33,000	8.1	1.20
City of Red Wing	18,000	489.1	37.49
Richards Asphalt	24,000	323	33.01
Olmsted Co.	59,000	151	37.94
Quadrant	29,000	35	4.32
Pope-Douglas	18,000	443.2	33.98
Fergus Falls	27,200	438	50.74
Polk Co.	28,000	269.7	32.16
Sum, grams per year			230.85

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (.028 dscm/dscf) * (g/10E9 ng) * (2000 lb/ton) * (CONC ng/dscm) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Table 2 (continued)

Sulfur Dioxides

Facility	Actual Capacity 1990	Avg. Emis, ppm	Actual Emissions, tons
WLSSD	33,000	110	47.64
City of Red Wing	18,000	111	24.79
Richards Asphalt	24,000	29.3	8.73
Olmsted Co.	59,000	143.5	105.06
Quadrant	29,000	28.6	10.29
Pope-Douglas	18,000	41	9.16
Fergus Falls	27,200	19.7	6.65
Polk Co.	28,000	81	28.14
Sum, tons per year			240.46

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3/10E6 Btu) * (5500 Btu/lb) * (21/14) * (lb-mole/385 dscf) * (64 lbs/lb-mol SO2) * (PPM SO2/10E6) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Hydrogen Chloride

Facility	Actual Capacity 1990	Avg. Emis, ppm	Actual Emissions, tons
WLSSD	33,000	1	0.24
City of Red Wing	18,000	553	67.55
Richards Asphalt	24,000	839	136.64
Olmsted Co.	59,000	83	33.23
Quadrant	29,000	839	165.11
Pope-Douglas	18,000	282	34.45
Fergus Falls	27,200	1	0.18
Polk Co.	28,000	518	98.42
Sum, tons per year			535.82

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3/10E6 Btu) * (5500 Btu/lb) * (21/14) * (lb-mole/385 dscf) * (35 lbs/lb-mol HCl) * (PPM HCl/10E6) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Table 2A
Class C Waste Combustor's Potential Emissions w/Proposed Standards
All Emissions @ 7% O2

Mercury Emissions

Facility	Capacity	Emissions, ug/dscm	Pot. Emissions lbs.
WLSSD	35,900	60	21
City of Red Wing	28,743	600	159
Richards Asphalt	23,950	600	132
Olmsted Co.	60,246	600	333
Quadrant	34,700	600	192
Pope-Douglas	23,900	600	132
Fergus Falls	29,000	60	16
Polk Co.	32,650	600	180
Sum	269,089		1,165

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (.028 dscm/dscf) * (g/10E6 ug) * (lb/454 g) * (2000 lb/ton) * (CONC ug/dscm) * (TPY RDF)
For Mass Burn Plants: (RDF PTE) * (5200/5500)

PM emissions

Facility	Capacity	Avg. Emis, gr/dscf	Actual Emissions, tons
WLSSD	35,900	0.02	8
City of Red Wing	28,743	0.02	6
Richards Asphalt	23,950	0.02	5
Olmsted Co.	60,246	0.02	13
Quadrant	34,700	0.02	7
Pope-Douglas	23,900	0.02	5
Fergus Falls	29,000	0.02	6
Polk Co.	32,650	0.02	7
Sum	269,089		58

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (lb/7000 gr) * (CONC gr/dscf) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Dioxins Emissions

Facility	Capacity	Emissions, ng/dscm	Pot. Emission, grams/yr
WLSSD	35,900	500	81
City of Red Wing	28,743	500	61
Richards Asphalt	23,950	500	51
Olmsted Co.	60,246	500	128
Quadrant	34,700	500	74
Pope-Douglas	23,900	500	51
Fergus Falls	29,000	500	62
Polk Co.	32,650	500	70
Sum, grams per year			577

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (.028 dscm/dscf) * (g/10E9 ng) * (2000 lb/ton) * (CONC ng/dscm) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Table 2A (continued)

Sulfur Dioxides

Facility	Capacity	Emissions, ppm	Pot. Emissions, tons/yr
WLSSD	35,900	200	94
City of Red Wing	28,743	200	71
Richards Asphalt	23,950	200	59
Olmsted Co.	60,246	200	150
Quadrant	34,700	200	86
Pope-Douglas	23,900	200	59
Fergus Falls	29,000	200	72
Polk Co.	32,650	200	81
Sum, tons per year			673

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3/10E6 Btu) * (5500 Btu/lb) * (21/14) * (lb-mole/385 dscf) * (64 lbs/lb-mol SO2) * (PPM SO2/10E6) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Hydrogen Chloride

Facility	Capacity	Emissions, ppm	Pot. Emissions, tons/yr
WLSSD	35,900	600	155
City of Red Wing	28,743	600	117
Richards Asphalt	23,950	600	98
Olmsted Co.	60,246	600	245
Quadrant	34,700	600	141
Pope-Douglas	23,900	600	97
Fergus Falls	29,000	600	118
Polk Co.	32,650	600	133
Sum, tons per year			1,104

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3/10E6 Btu) * (5500 Btu/lb) * (21/14) * (lb-mole/385 dscf) * (35 lbs/lb-mol HCl) * (PPM HCl/10E6) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Table 2B

Class C Waste Combustor's Baseline Potential Emissions, existing conditions

All Emissions @ 7% O2

Mercury Emissions

Facility	Capacity	Emissions, ug/dscm	Pot. Emissions lbs.
WLSSD	35,900	200	70
City of Red Wing	28,743	650	172
Richards Asphalt	23,950	650	143
Olmsted Co.	60,246	650	361
Quadrant	34,700	650	208
Pope-Douglas	23,900	650	143
Fergus Falls	29,000	650	174
Polk Co.	32,650	650	195
Sum	269,089		1,466

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (.028 dscm/dscf) * (g/10E6 ug) * (lb/454 g) * (2000 lb/ton) * (CONC ug/dscm) * (TPY RDF)
For Mass Burn Plants: (RDF PTE) * (5200/5500)

PM emissions

Facility	Capacity	Avg. Emis, gr/dscf	Actual Emissions, tons
WLSSD	35,900	0.08	32
City of Red Wing	28,743	0.08	25
Richards Asphalt	23,950	0.08	20
Olmsted Co.	60,246	0.08	51
Quadrant	34,700	0.08	30
Pope-Douglas	23,900	0.08	20
Fergus Falls	29,000	0.08	25
Polk Co.	32,650	0.04	14
Sum	269,089		218

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (lb/7000 gr) * (CONC gr/dscf) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Dioxins Emissions

Facility	Capacity	Emissions, ng/dscm	Pot. Emission, grams/yr
WLSSD	35,900	50	8
City of Red Wing	28,743	500	61
Richards Asphalt	23,950	500	51
Olmsted Co.	60,246	500	128
Quadrant	34,700	500	74
Pope-Douglas	23,900	500	51
Fergus Falls	29,000	500	62
Polk Co.	32,650	500	70
Sum, grams per year			505

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3 /10E6 Btu) * (5500 Btu/lb) * (21/14) * (.028 dscm/dscf) * (g/10E9 ng) * (2000 lb/ton) * (CONC ng/dscm) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Table 2B (continued)

Sulfur Dioxides

Facility	Capacity	Emissions, ppm	Pot. Emissions, tons/yr
WLSSD	35,900	200	94
City of Red Wing	28,743	200	71
Richards Asphalt	23,950	200	59
Olmsted Co.	60,246	200	150
Quadrant	34,700	200	86
Pope-Douglas	23,900	200	59
Fergus Falls	29,000	200	72
Polk Co.	32,650	200	81
Sum, tons per year			673

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3/10E6 Btu) * (5500 Btu/lb) * (21/14) * (lb-mole/385 dscf) * (64 lbs/lb-mol SO2) * (PPM SO2/10E6) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Hydrogen Chloride

Facility	Capacity	Emissions, ppm	Pot. Emissions, tons/yr
WLSSD	35,900	6	2
City of Red Wing	28,743	600	117
Richards Asphalt	23,950	600	98
Olmsted Co.	60,246	600	245
Quadrant	34,700	600	141
Pope-Douglas	23,900	600	97
Fergus Falls	29,000	600	118
Polk Co.	32,650	600	133
Sum, tons per year			951

To Calculate Actual Emissions:
For RDF Plants: (9570 ft3/10E6 Btu) * (5500 Btu/lb) * (21/14) * (lb-mole/385 dscf) * (35 lbs/lb-mol HCl) * (PPM HCl/10E6) * (TPY RDF)
For Mass Burn Plants: (RDF) * (5200/5500)

Table 3
Class III Waste Combustor's Actual Estimated Emissions
All Emissions @ 7% O2

Mercury Emissions

Facility	Capacity tpy	Avg. Emis ug/dscm	Emissions, lbs/yr
Class III Indus	33,330	600	319
Medical WasteIII			
2 Uncontrolled	800	3000	42
Mayo	4000	1333	94
MSS	4000	538	38
SUM	**42,130**		**494**
Sum, Med			175

To Calculate Actual Emissions:
(9570 ft3 /10E6 Btu) * (HHV Btu/lb) * (21/14) * (.028 dscm/dscf) * (g/10E6 ug) * (lb/454 g) * (2000 lb/ton) * (CONC ug/dscm) * (TPY)
For Medical Waste: HHV=10000 Btu/lb
For Industrial Waste: HHV= 9,000 Btu/lb

PM emissions

Facility	Capacity tpy	Avg. Emis, gr/dscf	Emissions, tpy
Class III Indus	33,330	0.2	123
Medical WasteIII			
2 Uncontrolled	800	0.2	3
Mayo	4000	0.07	6
MSS	4000	0.01	1
SUM	**42,130**		**133**
Sum, Med			10

To Calculate Actual Emissions:
(9570 ft3 /10E6 Btu) * (HHV Btu/lb) * (21/14) * (lb/7000 gr) * (CONC gr/dscf) * (TPY)
For Medical Waste: HHV= 10,000 Btu/lb
For Industrial Waste: HHV= 9,000 Btu/lb

Dioxins Emissions

Facility	Capacity tpy	Avg. Emis, ng/dscm	Emissions, grams/yr
Class III Indus	33,330	5000	1,228
Medical WasteIII			
2 Uncontrolled	800	5000	33
Mayo	4000	20	1
MSS	4000	375	12
SUM	**42,130**		**1,274**
Sum, Med			46

To Calculate Actual Emissions:
(9570 ft3 /10E6 Btu) * (HHV Btu/lb) * (21/14) * (.028 dscm/dscf) * (g/10E9 ng) * (2000 lb/ton) * (CONC ng/dscm) * (TPY)
For Medical Waste: HHV= 10,000 Btu/lb
For Industrial Waste: HHV= 9,000 Btu/lb

Table 3 (continued)

Sulfur Dioxides

Facility	**Capacity tpy**	**Avg. Emis, ppm**	**Emissions, tpy**
Class III Indus	33,330	200	143
Medical WasteIII			
2 Uncontrolled	800	20	0
Mayo	4000	20	2
MSS	4000	20	2
SUM	**42,130**		**147**
Sum, Med			4

To Calculate Actual Emissions:
(9570 ft3/10E6 Btu) * (HHV Btu/lb) * (21/14) * (lb-mole/385 dscf) * (64 lbs/lb-mol SO2) * (PPM SO2/10E6) * (TPY)
For Medical Waste: HHV= 10,000 Bty/lb
For Industrial Waste: HHV= 9,000 Btu/lb

Hydrogen Chloride

Facility	**Capacity tpy**	**Avg. Emis, ppm**	**Emissions, tpy**
Class III Indus	33,330	600	235
Medical WasteIII			
2 Uncontrolled	800	1800	19
Mayo	4000	180	9
MSS	4000	180	9
SUM	**42,130**		**272**
Sum, Med			38

To Calculate Actual Emissions:
(9570 ft3/10E6 Btu) * (HHV Btu/lb) * (21/14) * (lb-mole/385 dscf) * (35 lbs/lb-mol HCl) * (PPM HCl/10E6) * (TPY)
For Medical Waste: HHV= 10,000 Btu/lb
For Industrial Waste: HHV= 9,000 Btu/lb

Table 4
Class IV Waste Combustor's Estimated Actual Emissions
All Emissions @ 7% O2

Mercury Emissions

Facility	Capacity tpy	Waste Stream	Emissions, lbs/yr
Class IV	138,000	4	1,104
Pathological*			56
Medical**	500	0.02	12

*Represents emissions from crematoria
**30 Med waste incinerators in 1992

PM emissions

Facility	Capacity, tpy	Avg. Emis, gr/dscf	Emissions, tpy
Class IV	138,000	0.45	892
Pathological	525	0.45	2
Medical Waste	500	0.45	5

To Calculate Actual Emissions:
(9570 ft3 /10E6 Btu) * (HHV Btu/lb) * (21/14) * (lb/7000 gr) * (CONC gr/dscf) * (TPY)
For Medical Waste: HHV= 10,000 Btu/lb
For Class IV Waste: HHV= 7,000 Btu/lb
For Pathological Waste HHV=4,500 Btu/lb

Dioxins Emissions

Facility	Capacity, tpy	Avg. Emis, ng/dscm	Emissions, grams/yr
Class IV*	138,000	30,000	23,296
Class IV*	138,000	3,000	2,330
Pathological	525	600	1
Medical, Class IV	500	30,000	123

To Calculate Actual Emissions:
(9570 ft3 /10E6 Btu) * (HHV Btu/lb) * (21/14) * (.028 dscm/dscf) * (g/10E9) * (CONC ng/dscm) * (TPY) * 2000 lb/ton
For Medical Waste: HHV= 10,000 Btu/lb
For Class IV Waste: HHV= 7,000 Btu/lb
For Pathological Waste HHV=4,500 Btu/lb

*Class IV estimates represent a range from 3,000 to 30,000 ng/dscm

Table 4 (continued)

Sulfur Dioxides

Facility	Capacity, tpy	Avg. Emis, ppm	Emissions, tpy
Class IV	138,000	200.00	461
Pathological*	525	125.00	0.70
Medical**	500	20.00	0.24

To Calculate Actual Emissions:
(9570 ft3/10E6 Btu) * (HHV Btu/lb) * (21/14) * (lb-mole/385 dscf) * (64 lbs/lb-mol SO2) * (PPM SO2/10E6) * (TPY)
For Medical Waste: HHV = 10,000 Bty/lb
For Class IV Waste: HHV = 7,000 Btu/lb
For Pathological Waste HHV = 4,500 Btu/lb

Hydrogen Chloride

Facility	Capacity, tpy	Avg. Emis, ppm	Emissions, tpy
Class IV	138,000	600.00	756
Pathological*	525	100.00	0.31
Medical**	500	1800.00	12

To Calculate Actual Emissions:
(9570 ft3/10E6 Btu) * (HHV Btu/lb) * (21/14) * (lb-mole/385 dscf) * (35 lbs/lb-mol HCl) * (PPM HCl/10E6) * (TPY)
For Medical Waste: HHV = 10,000 Bty/lb
For Class IV Waste: HHV = 7,000 Btu/lb
For Pathological Waste HHV = 4,500 Btu/lb

Appendix 3

40 CFR Part 60, Subparts Ca, Ea.

proved by the Administrator in accordance with this subpart.

§ 60.29 Plan revisions by the Administrator.

After notice and opportunity for public hearing in each affected State, the Administrator may revise any provision of an applicable plan if:

(a) The provision was promulgated by the Administrator, and

(b) The plan, as revised, will be consistent with the Act and with the requirements of this subpart.

Subpart C—Emission Guidelines and Compliance Times

§ 60.30 Scope.

The following subparts contain emission guidelines and compliance times for the control of certain designated pollutants in accordance with section 111(d) of the Act and subpart B.

(a) Subpart Ca—Municipal Waste Combustors.

(b) Subpart Cb—Sulfuric Acid Production Plants.

[56 FR 5523, Feb. 11, 1991]

§ 60.31 Definitions.

Terms used but not defined in this subpart have the meaning given them in the Act and in subparts A and B of this part.

[42 FR 55797, Oct. 18, 1977]

Subpart Ca—Emissions Guidelines and Compliance Times for Municipal Waste Combustors

SOURCE: 56 FR 5523, Feb. 11, 1991, unless otherwise noted.

§ 60.30a Scope.

This subpart contains emission guidelines and compliance times for the control of certain designated pollutants from certain MWC's in accordance with section 111(d) of the Act and subpart B.

§ 60.31a Definitions.

Terms used but not defined in this subpart have the meaning given them in the Act and subparts A, B, and Ea of this part.

Large MWC plant means an MWC plant with an MWC plant capacity greater than 225 megagrams per day (250 tons per day) but less than or equal to 1,000 megagrams per day (1,100 tons per day) of MSW.

MWC plant means one or more MWC units at the same location for which construction, modification, or reconstruction is commenced on or before December 20, 1989.

MWC plant capacity means the aggregate MWC unit capacity of all MWC units at an MWC plant for which construction, modification, or reconstruction is commenced on or before December 20, 1989.

Very large MWC plant means an MWC plant with an MWC plant capacity greater than 1,000 megagrams per day (1,100 tons per day) of MSW.

§ 60.32a Designated facilities.

(a) The designated facility to which the guidelines apply is each MWC with an MWC unit capacity greater than 225 megagrams per day (250 tons per day) for which construction, modification, or reconstruction is commenced on or before December 20, 1989.

(b) [Reserved]

(c) Designated facilities that combust tires or fuel derived solely from tires and that combust no other MSW or RDF are exempt from all provisions of this subpart except an initial report of start-up date, location, and the types and amounts of fuel they fire.

(d) Cofired combustors, as defined under § 60.51a of subpart Ea, are exempt from all provisions of this subpart except the initial report as required under § 60.59a, paragraph (a) of subpart Ea, and records and reports of the daily weight of MSW or RDF and other fuels fired as required under § 60.59a, paragraphs (b)(14) and (m) of subpart Ea.

(e) Cofired combustors that are subject to a Federally-enforceable permit limiting the operation of the combustor to no more than 225 megagrams per day (250 tons per day) of MSW or RDF are exempt from all provisions of this subpart.

(f) Municipal waste combustors combusting medical waste with MSW and meeting all other applicability requirements are subject to all provisions of this subpart. Units firing solely segregated medical waste are not covered by this subpart.

(g) Physical or operational changes made to an existing MWC unit to comply with the emission guidelines under this subpart are not considered a modification or reconstruction and would not bring an existing MWC unit under the provisions at subpart Ea (see § 60.50a(g)).

§ 60.33a Emission guidelines for municipal waste combustor metals.

(a) For approval, a State plan shall include the emission guidelines for MWC metals listed below, except as provided for under § 60.24. The emission guidelines for MWC metals, expressed as PM contained in gases discharged to the atmosphere from any designated facility located within a large or very large MWC plant, are as follows:

GUIDELINE EMISSION LEVEL

[Milligrams per dry standard cubic meter]

MWC plant capacity	Grains per dry standard cubic foot	Opacity
Very large	34 (0.015)	10% (6-min.).
Large	69 (0.030)	10% (6-min.).

NOTE: All emission levels corrected to 7 percent O.

(b) [Reserved]

§ 60.34a Emission guidelines for municipal waste combustor organics.

For approval, a State plan shall include the emission guidelines for MWC organics listed below, except as provided for under § 60.24. The emission guidelines for the concentration of the dioxin/furan component of MWC organics discharged into the atmosphere from any designated facility located within a large or very large MWC plant are as follows:

MWC plant capacity and type	Guideline emission level: Nanograms per standard cubic meter	Guideline emission level: Grains per billion dry standard cubic foot
Very Large (including very large RDF)	60	24
Large (except RDF stokers and coal/RDF mixed fuel-fired combustors)	125	50
Large RDF stokers and coal/RDF mixed fuel-fired combustors	250	100

NOTE: All emission levels corrected to 7 percent O_2.

§ 60.35a Emission guidelines for municipal waste combustor acid gases.

For approval, a State plan shall include the emission guidelines for MWC acid gases for plants listed below, except as provided for under § 60.24. The emission guidelines for MWC acid gases, expressed as sulfur dioxide and hydrogen chloride contained in gases discharged to the atmosphere from any designated facility located within a large or very large MWC plant, are as follows:

MWC plant capacity	Guidelines emission level (percent reduction or parts per million by volume): SO_2	Guidelines emission level (percent reduction or parts per million by volume): HCl
Very large	70% or 30 ppmv	90% or 25 ppmv.
Large	50% or 30 ppmv	50% or 25 ppmv.

NOTE: All ppmv levels corrected to 7 percent O_2. SO_2 emission levels and percent reductions are 24-hour geometric means.

Either the applicable percent reduction or the parts per million by volume guideline, whichever is less stringent, is the guideline limit for a designated facility.

§ 60.36a Emission guidelines for municipal waste combustor operating practices, training, and municipal waste combustor operator certification.

(a) For approval, a State plan shall include the emission guidelines for carbon monoxide listed below, except as provided for under § 60.24. The emission guidelines for the carbon monoxide concentration level for each designated facility located within a large or very large MWC plant are shown in Table 1.

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TABLE 1.—MWC OPERATING GUIDELINES

MWC technology	Carbon monoxide emission level (parts per million by volume) [1]	Averaging time
Mass burn waterwall	100	4 hour.
Mass burn refractory	100	4 hour.
Mass burn rotary waterwall	250	24 hour.
Modular starved air	50	4 hour.
Modular excess air	50	4 hour.
Refuse derived fuel stoker	200	24 hour.
Bubbling fluidized bed combustor.	100	4 hour.
Circulating fluidized bed combustor.	100	4 hour.
Coal/RDF mixed fuel-fired combustors.	150	4 hour.

[1] Measured at the combustor outlet in conjunction with a measurement of oxygen concentration, corrected to 7 percent oxygen (dry basis). Calculated as an arithmetic average.

(b) For approval, a State plan shall include the requirements for MWC operating practices, operator certification and training listed in § 60.56a of subpart Ea, except as provided for under § 60.24.

§ 60.37a [Reserved]

§ 60.38a Compliance and performance testing and compliance times.

(a) For approval, a State plan shall include, for designated facilities located within large and very large MWC plants, the compliance and performance testing methods listed in § 60.58a of subpart Ea for large MWC plants, as applicable, except as provided for under § 60.24. The compliance methods under § 60.58a for nitrogen oxide are not applicable to designated facilities located within large or very large MWC plants.

(b) [Reserved]

(c) Except as provided for under paragraph (d) of this section, planning, awarding of contracts, and installation of equipment capable of attaining the level of the emission guidelines established under this subpart are expected to be accomplished within 36 months after the effective date of State emission standards for MWC units.

(d) [Reserved]

§ 60.39a Reporting and recordkeeping guidelines.

For approval, a State plan shall include the reporting and recordkeeping provisions listed in § 60.59a, as applicable, except as provided for under § 60.24.

Subpart Cb—Emission Guidelines and Compliance Times for Sulfuric Acid Production Units

SOURCE: 56 FR 5525, Feb. 11, 1991, unless otherwise noted.

§ 60.30b Designated facilities.

Sulfuric acids production units. The designated facility to which §§ 60.31b and 60.32b apply is each existing "sulfuric acid production unit" as defined in § 60.81(a) of subpart H.

§ 60.31b Emission guidelines.

Sulfuric acid production units. The emission guideline for designated facilities is 0.25 gram sulfuric acid mist (as measured by Method 8 of appendix A) per kilogram of sulfuric acid produced (0.5 pounds per ton), the production being expressed as 100 percent H_2SO_4.

60.32b Compliance times.

Sulfuric acid production units. Planning, awarding of contracts, and installation of equipment capable of attaining the level of the emission guideline established under 60.33(a) can be accomplished within 17 months after the effective date of a State emission standard for sulfuric acid mist.

Subpart D—Standards of Performance for Fossil-Fuel-Fired Steam Generators for Which Construction Is Commenced After August 17, 1971

§ 60.40 Applicability and designation of affected facility.

(a) The affected facilities to which the provisions of this subpart apply are:

(1) Each fossil-fuel-fired steam generating unit of more than 73 megawatts heat input rate (250 million Btu per hour).

(2) Each fossil-fuel and wood-residue-fired steam generating unit capable of firing fossil fuel at a heat input rate of more than 73 megawatts (250 million Btu per hour).

(b) Any change to an existing fossil-fuel-fired steam generating unit to accommodate the use of combustible materials, other than fossil fuels as defined in this subpart, shall not bring that unit under the applicability of this subpart.

(c) Except as provided in paragraph (d) of this section, any facility under paragraph (a) of this section that commenced construction or modification after August 17, 1971, is subject to the requirements of this subpart.

(d) The requirements of §§ 60.44 (a)(4), (a)(5), (b) and (d), and 60.45(f)(4)(vi) are applicable to lignite-fired steam generating units that commenced construction or modification after December 22, 1976.

(e) Any facility covered under Subpart Da is not covered under this subpart.

[42 FR 37936, July 25, 1977, as amended at 43 FR 9278, Mar. 7, 1978; 44 FR 33612, June 17, 1979]

§ 60.41 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act, and in Subpart A of this part.

(a) *Fossil-fuel fired steam generating unit* means a furnace or boiler used in the process of burning fossil fuel for the purpose of producing steam by heat transfer.

(b) *Fossil fuel* means natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials for the purpose of creating useful heat.

(c) *Coal refuse* means waste-products of coal mining, cleaning, and coal preparation operations (e.g. culm, gob, etc.) containing coal, matrix material, clay, and other organic and inorganic material.

(d) *Fossil fuel and wood residue-fired steam generating unit* means a furnace or boiler used in the process of burning fossil fuel and wood residue for the purpose of producing steam by heat transfer.

(e) *Wood residue* means ba dust, slabs, chips, shavings, m and other wood products deriv wood processing and forest r ment operations.

(f) *Coal* means all solid fuel fied as anthracite, bituminous tuminous, or lignite by the A Society and Testing and M Designation D388-77 (incorpor reference—see §60.17).

[39 FR 20791, June 14, 1974, as am 40 FR 2803, Jan. 16, 1975; 41 FR 51 22, 1976; 43 FR 9278, Mar. 7, 197 3736, Jan. 27, 1983]

§ 60.42 Standard for particulate m

(a) On and after the date on the performance test required conducted by § 60.8 is comple owner or operator subject to th sions of this subpart shall caus discharged into the atmospher any affected facility any gases

(1) Contain particulate ma excess of 43 nanograms per jou input (0.10 lb per million Btu) from fossil fuel or fossil fuel an residue.

(2) Exhibit greater than 20 opacity except for one six- period per hour of not more t percent opacity.

(b)(1) On or after Decemb 1979, no owner or operator shal to be discharged into the atmo from the Southwestern Public Company's Harrington Station Amarillo, TX, any gases which greater than 35% opacity, excep a maximum or 42% opacity s permitted for not more than 6 m in any hour.

(2) Interstate Power Compan not cause to be discharged into mosphere from its Lansing Unit No. 4 in Lansing, IA, any which exhibit greater than 32% ty, except that a maximum o opacity shall be permitted f more than six minutes in any ho

(3) Omaha Public Power D shall not cause to be discharge the atmosphere from its Ne City Power Station in Nebraska NE, any gases which exhibit g than 30% opacity, except that a mum of 37% opacity shall be p

8 is completed, no ;ubject to the provi- hall cause to be dis- mosphere from any ıy gases which con- ıatter in excess of r/dscf) corrected to

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f operations.

operator of any in- o the provisions of rd the daily charg- of operation.

and procedures.

ȝ the performance 60.8, the owner or as reference meth- ; the test methods this part or other :dures as specified ept as provided in

operator shall de- : with the particu- ·d in § 60.52 as fol-

·ate (c_{12}) of particu- ted to 12 percent ›uted for each run equation:

particulate matter, :ent CO_2, g/dscm (gr/

articulate matter, g/

ation, percent dry

l be used to deter- te matter concen- ampling time and ach run shall be at nd 0.85 dscm (30

ı rate correction or grab sampling ure of Method 3B :termine CO_2 con-

e shall be obtained ı, and at the same he particulate run. un has more than the CO_2 traverse

points may be reduced to 12 if Method 1 is used to locate the 12 CO_2 traverse points. If individual CO_2 samples are taken at each traverse point, the CO_2 concentration ($\%CO_2$) used in the correction equation shall be the arithmetic mean of all the individual CO_2 sample concentrations at each traverse point.

(ii) If sampling is conducted after a wet scrubber, an "adjusted" CO_2 concentration [$(\%CO_2)_{adj}$], which accounts for the effects of CO_2 absorption and dilution air, may be used instead of the CO_2 concentration determined in this paragraph. The adjusted CO_2 concentration shall be determined by either of the procedures in paragraph (c) of this section.

(c) The owner or operator may use either of the following procedures to determine the adjusted CO_2 concentration.

(1) The volumetric flow rates at the inlet and outlet of the wet scrubber and the inlet CO_2 concentration may be used to determine the adjusted CO_2 concentration [$(\%CO_2)_{adj}$] using the following equation:

$$(\%CO_2)_{adj}=(\%CO_2)_{di}\ (Q_{di}/Q_{do})$$

where:

$(\%CO_2)_{adj}$=adjusted outlet CO_2 concentration, percent dry basis.

$(\%CO_2)_{di}$=CO_2 concentration measured before the scrubber, percent dry basis.

Q_{di}=volumetric flow rate of effluent gas before the wet scrubber, dscm/min (dscf/min).

Q_{do}=volumetric flow rate of effluent gas after the wet scrubber, dscm/min (dscf/min).

(i) At the outlet, Method 5 is used to determine the volumetric flow rate (Q_{do}) of the effluent gas.

(ii) At the inlet, Method 2 is used to determine the volumetric flow rate (Q_{di}) of the effluent gas as follows: Two full velocity traverses are conducted, one immediately before and one immediately after each particulate run conducted at the outlet, and the results are averaged.

(iii) At the inlet, the emission rate correction factor, integrated sampling and analysis procedure of Method 3B is used to determine the CO_2 concentration [$(\%CO_2)_{di}$] as follows: At least nine sampling points are selected ran-

domly from the velocity traverse points and are divided randomly into three sets, equal in number of points; the first set of three or more points is used for the first run, the second set for the second run, and the third set for the third run. The CO_2 sample is taken simultaneously with each particulate run being conducted at the outlet, by traversing the three sampling points (or more) and sampling at each point for equal increments of time.

(2) Excess air measurements may be used to determine the adjusted CO_2 concentration [$(\%CO_2)_{adj}$] using the following equation:

$$(\%CO_2)_{adj}=(\%CO_2)_{di}\ [(100+\%EA_i)/(100+\%EA_o)]$$

where:

$(\%CO_2)_{adj}$=adjusted outlet CO_2 concentration, percent dry basis.

$(\%CO_2)_{di}$=CO_2 concentration at the inlet of the wet scrubber, percent dry basis.

$\%EA_i$=excess air at the inlet of the scrubber, percent.

$\%EA_o$=excess air at the outlet of the scrubber, percent.

(i) A gas sample is collected as in paragraph (c)(1)(iii) of this section and the gas samples at both the inlet and outlet locations are analyzed for CO_2, O_2, and N_2.

(ii) Equation 3B-3 of Method 3B is used to compute the percentages of excess air at the inlet and outlet of the wet scrubber.

[54 FR 6665, Feb. 14, 1989, as amended at 55 FR 5212, Feb. 14, 1990]

Subpart Ea—Standards of Performance for Municipal Waste Combustors

SOURCE: 56 FR 5507, Feb. 11, 1991, unless otherwise noted.

EFFECTIVE DATE NOTE: At 56 FR 5507, Feb. 11, 1991, Subpart Ea was added, effective Aug. 12, 1991.

§ 60.50a Applicability and delegation of authority.

(a) The affected facility to which this subpart applies is each MWC unit with an MWC unit capacity greater than 225 megagrams per day (250 tons per day) of MSW or RDF for which construction, modification, or reconstruction is commenced after December 20, 1989.

(b) [Reserved]

(c) Affected facilities that combust tires or fuel derived solely from tires and that combust no other MSW or RDF are exempt from all provisions of this subpart except the initial report required under § 60.59a, paragraph (a).

(d) Cofired combustors, as defined under § 60.51a, are exempt from all provisions of this subpart except the initial report required under § 60.59a, paragraph (a), and records and reports of the daily weight of MSW or RDF and other fuels fired as required under § 60.59a, paragraphs (b)(14) and (m).

(e) Cofired combustors that are subject to a Federally-enforceable permit limiting the operation of the combustor to no more than 225 megagrams per day (250 tons per day) of MSW or RDF are exempt from all provisions of this subpart.

(f) Physical or operational changes made to an existing MWC unit solely to comply with emission guidelines under subpart Ca are not considered a modification or reconstruction and do not bring an existing MWC unit under this subpart.

(g) Municipal waste combustors combusting medical waste combined with other MSW are subject to all provisions of this subpart. Units combusting solely medical waste are not covered by this subpart.

(h) The following authorities shall be retained by the Administrator and not transferred to a State:

None

(i) This subpart shall become effective on August 12, 1991.

§ 60.51a Definitions.

ASME means the American Society of Mechanical Engineers.

Batch MWC means an MWC unit designed such that it cannot combust MSW continuously 24 hours per day because the design does not allow waste to be fed to the unit or ash to be removed while combustion is occurring.

Bubbling fluidized bed combustor means a fluidized bed combustor in which the majority of the bed materiremains in a fluidized state in the imary combustion zone.

Chief facility operator means the ·rson in direct charge and control of e operation of an MWC and who is sponsible for daily on-site supervi- ›n, technical direction, management, ıd overall performance of the facili-

Circulating fluidized bed combustor eans a fluidized bed combustor in ıich the majority of the fluidized d material is carried out of the pri- ary combustion zone and is trans- ›rted back to the primary zone rough a recirculation loop.

Coal/RDF mixed fuel fired combus- r means a combustor that fires coal ıd RDF simultaneously.

Cofired combustor means a unit mbusting MSW or RDF with a non- SW fuel and subject to a Federally .forceable permit limiting the unit to mbusting a fuel feed stream, 30 per- nt or less of the weight of which is mprised, in aggregate, of MSW or DF as measured on a 24-hour daily .sis. A unit combusting a fuel feed ream, more than 30 percent of the ›ight of which is comprised, in aggre- te, of MSW or RDF shall be consid- ed an MWC unit and not a cofired mbustor. Cofired combustors which ·e less than 30 percent segregated edical waste and no other municipal lid waste are not covered by this bpart.

Continuous emission monitoring stem or *CEMS* means a monitoring stem for continuously measuring the ıissions of a pollutant from an af- cted facility.

Dioxin/furan means total tetra- rough octachlorinated dibenzo-p- oxins and dibenzofurans.

Federally-enforceable means all limi- tions and conditions that are en- rceable by the Administrator includ- g the requirements of 40 CFR parts and 61, requirements within any ap- icable State implementation plan, ıd any permit requirements estab- ;hed under 40 CFR 52.21 or under 40 FR 51.18 and 40 CFR 51.24.

Four-hour block average or *4-hour ock average* means the average of all ›urly emission rates when the affect- l facility is operating and combusting SW measured over 4-hour periods of time from 12 midnight to 4 a.m., 4 a.m. to 8 a.m., 8 a.m. to 12 noon, 12 noon to 4 p.m., 4 p.m. to 8 p.m., and 8 p.m. to 12 midnight.

Large MWC plant means an MWC plant with an MWC plant capacity greater than 225 megagrams per day (250 tons per day) of MSW.

Mass burn refractory MWC means a combustor that combusts MSW in a refractory wall furnace. This does not include rotary combustors without wa- terwalls.

Mass burn rotary waterwall MWC means a combustor that combusts MSW in a cylindrical rotary waterwall furnace. This does not include rotary combustors without waterwalls.

Mass burn waterwall MWC means a combustor that combusts MSW in a conventional waterwall furnace.

Maximum demonstrated particulate matter control device temperature means the maximum 4-hour block av- erage temperature measured at the final particulate matter control device inlet during the most recent dioxin/ furan test demonstrating compliance with the applicable standard for MWC organics specified under § 60.53a. If more than one particulate matter con- trol device is used in series at the af- fected facility, the maximum 4-hour block average temperature is meas- ured at the final particulate matter control device.

Maximum demonstrated MWC unit load means the maximum 4-hour block average MWC unit load achieved during the most recent dioxin/furan test demonstrating compliance with the applicable standard for MWC or- ganics specified under § 60.53a.

Medical waste means any solid waste which is generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertain- ing thereto, or in production or testing of biologicals. Medical waste does not include any hazardous waste identified under subtitle C of the Resource Con- servation and Recovery Act or any household waste as defined in regula- tions under subtitle C of the Resource Conservation and Recovery Act.

Modular excess air MWC means a combustor that combusts MSW and that is not field-erected and has multi- ple combustion chambers, all of which

are designed to operate at conditions with combustion air amounts in excess of theoretical air requirements.

Modular starved air MWC means a combustor that combusts MSW and that is not field-erected and has multi- ple combustion chambers in which the primary combustion chamber is de- signed to operate at substoichiometric conditions.

Municipal-type solid waste or *MSW* means household, commercial/retail, and/or institutional waste. Household waste includes material discarded by single and multiple residential dwell- ings, hotels, motels, and other similar permanent or temporary housing es- tablishments or facilities. Commer- cial/retail waste includes material dis- carded by stores, offices, restaurants, warehouses, nonmanufacturing activi- ties at industrial facilities, and other similar establishments or facilities. In- stitutional waste includes material dis- carded by schools, hospitals, nonman- ufacturing activities at prisons and government facilities and other similar establishments or facilities. House- hold, commercial/retail, and institu- tional waste do not include sewage, wood pallets, construction and demoli- tion wastes, industrial process or man- ufacturing wastes, or motor vehicles (including motor vehicle parts or vehi- cle fluff). Municipal-type solid waste does include motor vehicle mainte- nance materials, limited to vehicle bat- teries, used motor oil, and tires. Mu- nicipal type solid waste does not in- clude wastes that are solely segregated medical wastes. However, any mixture of segregated medical wastes and other wastes which contains more than 30 percent waste medical waste discards, is considered to be municipal- type solid waste.

Municipal waste combustor or *MWC* or *MWC unit* means any device that combusts, solid, liquid, or gasified MSW including, but not limited to, field-erected incinerators (with or without heat recovery), modular incin- erators (starved air or excess air), boil- ers (i.e., steam generating units), fur- naces (whether suspension-fired, grate-fired, mass-fired, or fluidized bed-fired) and gasification/combustion units. This does not include combus- tion units, engines, or other devices that combust landfill gases collected by landfill gas collection systems.

MWC acid gases means all acid gases emitted in the exhaust gases from MWC units including, but not limited to, sulfur dioxide and hydrogen chlo- ride gases.

MWC metals means metals and metal compounds emitted in the ex- haust gases from MWC units.

MWC organics means organic com- pounds emitted in the exhaust gases from MWC units and includes total tetra- through octa-chlorinated di- benzo-p-dioxins and dibenzofurans.

MWC plant means one or more MWC units at the same location for which construction, modification, or reconstruction is commenced after De- cember 20, 1989.

MWC plant capacity means the ag- gregate MWC unit capacity of all MWC units at an MWC plant for which construction, modification, or reconstruction commenced after De- cember 20, 1989. Any MWC units for which construction, modification, or reconstruction is commenced on or before December 20, 1989, are not in- cluded for determining applicability under this subpart.

MCW unit capacity means the maxi- mum design charging rate of an MWC unit expressed in megagrams per day (tons per day) of MSW combusted, cal- culated according to the procedures under § 60.58a, paragraph (j). Munici- pal waste combustor unit capacity is calculated using a design heating value of 10,500 kilojoules per kilogram (4,500 British thermal units per pound) for MSW and 19,800 kilojoules per kilo- gram (8,500 British thermal units per pound) for medical waste. The calcula- tional procedures under § 60.58a(j) in- clude procedures for determining MWC unit capacity for batch MWC's and cofired combustors and combus- tors firing mixtures of medical waste and other MSW.

Particulate matter means total par- ticulate matter emitted from MWC units as measured by Method 5 (see § 60.58a).

Potential hydrogen chloride emis- sion rate means the hydrogen chloride emission rate that would occur from combustion of MSW in the absence of any hydrogen chloride emissions control.

Potential sulfur dioxide emission rate means the sulfur dioxide emission rate that would occur from combustion of MSW in the absence of any sulfur dioxide emissions control.

Refuse-derived fuel or *RDF* means a type of MSW produced by processing MSW through shredding and size classification.

This includes all classes of RDF including low density fluff RDF through densified RDF and RDF fuel pellets.

RDF stoker means a steam generating unit that combusts RDF in a semi-suspension firing mode using air-fed distributors.

Same location means the same or contiguous property that is under common ownership or control, including properties that are separated only by a street, road, highway, or other public right-of-way. Common ownership or control includes properties that are owned, leased, or operated by the same entity, parent entity, subsidiary, subdivision, or any combination thereof, including any municipality or other governmental unit, or any quasi-governmental authority (e.g., a public utility district or regional waste disposal authority).

Shift supervisor means the person in direct charge and control of the operation of an MWC and who is responsible for on-site supervision, technical direction, management, and overall performance of the facility during an assigned shift.

Standard conditions means a temperature of 293° Kelvin (68° Fahrenheit) and a pressure of 101.3 kilopascals (29.92 inches of mercury).

Twenty-four hour daily average or *24-hour daily average* means the arithmetic or geometric mean (as specified in § 60.58a (e), (g), or (h) as applicable) of all hourly emission rates when the affected facility is operating and firing MSW measured over a 24-hour period between 12 midnight and the following midnight.

§ 60.52a Standard for municipal waste combustor metals.

(a) On and after the date on which the initial compliance test is completed or is required to be completed under § 60.8, no owner or operator of an affected facility located within a large MWC plant shall cause to be discharged into the atmosphere from that affected facility any gases that contain particulate matter in excess of 34 milligrams per dry standard cubic meter (0.015 grains per dry standard cubic foot), corrected to 7 percent oxygen (dry basis).

(b) On and after the date on which the initial compliance test is completed or is required to be completed under § 60.8, no owner or operator of an affected facility subject to the particulate matter emission limit under paragraph (a) of this section shall cause to be discharged into the atmosphere from that affected facility any gases that exhibit greater than 10 percent opacity (6-minute average).

(c) [Reserved]

§ 60.53a Standard for municipal waste combustor organics.

(a) [Reserved]

(b) On and after the date on which the initial compliance test is completed or is required to be completed under § 60.8, no owner or operator of an affected facility located within a large MWC plant shall cause to be discharged into the atmosphere from that affected facility any gases that contain dioxin/furan emissions that exceed 30 nanograms per dry standard cubic meter (12 grains per billion dry standard cubic feet), corrected to 7 percent oxygen (dry basis).

§ 60.54a Standard for municipal waste combustor acid gases.

(a)—(b) [Reserved]

(c) On and after the date on which the initial compliance test is completed or is required to be completed under § 60.8, no owner or operator of an affected facility located within a large MWC plant shall cause to be discharged into the atmosphere from that affected facility any gases that contain sulfur dioxide in excess of 20 percent of the potential sulfur dioxide emission rate (80 percent reduction by weight or volume) or 30 parts per million by volume, corrected to 7 percent oxygen (dry basis), whichever is less stringent. The averaging time is specified in § 60.58a(e).

(d) On and after the date on which the initial compliance test is completed or is required to be completed under § 60.8, no owner or operator of an affected facility located within a large MWC plant shall cause to be discharged into the atmosphere from that affected facility any gases that contain hydrogen chloride in excess of 5 percent of the potential hydrogen chloride emission rate (95 percent reduction by weight or volume) or 25 parts per million by volume, corrected to 7 percent oxygen (dry basis), whichever is less stringent.

§ 60.55a Standard for nitrogen oxides.

On and after the date on which the initial compliance test is completed or is required to be completed under § 60.8, no owner or operator of an affected facility located within a large MWC plant shall cause to be discharged into the atmosphere from that affected facility any gases that contain nitrogen oxides in excess of 180 parts per million by volume, corrected to 7 percent oxygen (dry basis). The averaging time is specified under § 60.58a(g).

§ 60.56a Standards for municipal waste combustor operating practices.

(a) On and after the date on which the initial compliance test is completed or is required to be completed under § 60.8, no owner or operator of an affected facility located within a large MWC plant shall cause such facility to exceed the carbon monoxide standards shown in table 1.

TABLE 1—MWC OPERATING STANDARDS

MWC technology	Carbon monoxide emission limit (parts per million by volume) [1]
Mass burn waterwall	100
Mass burn refractory	100
Mass burn rotary waterwall	100
Modular starved air	50
Modular excess air	50
RDF stoker	150
Bubbling fluidized bed combustor	100
Circulating fluidized bed combustor	100
Coal/RDF mixed fuel fired combustors	150

[1] Measured at the combustor outlet in conjunction with a measurement of oxygen concentration, corrected to 7 percent oxygen (dry basis). The averaging times are specified in § 60.58a(h).

(b) No owner or operator of an affected facility located within a large MWC plant shall cause such facility to operate at a load level greater than 110 percent of the *maximum demonstrated MWC unit load* as defined in § 60.51a. The averaging time is specified under § 60.58a(h).

(c) No owner or operator of an affected facility located within a large MWC plant shall cause such facility to operate at a temperature, measured at the final particulate matter control device inlet, exceeding 17° Centigrade (30° Fahrenheit) above the *maximum demonstrated* particulate matter control device temperature as defined in § 60.51a. The averaging time is specified under § 60.58a(h).

(d) Within 24 months from the date of start-up of an affected facility or before February 11, 1993, whichever is later, each chief facility operator and shift supervisor of an affected facility located within a large MWC plant shall obtain and keep current either a provisional or operator certification in accordance with ASME QRO-1-1989 (incorporated by reference, see § 60.17) or an equivalent State-approved certification program.

(e) No owner or operator of an affected facility shall allow such affected facility located at a large MWC plant to operate at any time without a certified shift supervisor, as provided under paragraph (d) of this section, on duty at the affected facility. This requirement shall take effect 24 months after the date of start-up of the affected facility or on and after February 11, 1993, whichever is later.

(f) The owner or operator of an affected facility located within a large MWC plant shall develop and update on a yearly basis a sitespecific operating manual that shall, at a minimum, address the following elements of MWC unit operation:

(1) Summary of the applicable standards under this subpart;

(2) Description of basic combustion theory applicable to an MWC unit;

(3) Procedures for receiving, handling, and feeding MSW;

(4) MWC unit start-up, shutdown, and malfunction procedures;

(5) Procedures for maintaining proper combustion air supply levels;

(6) Procedures for operating the MWC unit within the standards established under this subpart;

(7) Procedures for responding to periodic upset or off-specification conditions;

(8) Procedures for minimizing particulate matter carryover;

(9) Procedures for monitoring the degree of MSW burnout;

(10) Procedures for handling ash;

(11) Procedures for monitoring MWC unit emissions; and

(12) Reporting and recordkeeping procedures.

(g) The owner or operator of an affected facility located within a large MWC plant shall establish a program for reviewing the operating manual annually with each person who has responsibilities affecting the operation of an affected facility including, but not limited to, chief facility operators, shift supervisors, control room operators, ash handlers, maintenance personnel, and crane/load handlers.

(h) The initial review of the operating manual, as specified under paragraph (g) of this section, shall be conducted prior to assumption of responsibilities affecting MWC unit operation by any person required to undergo training under paragraph (g) of this section. Subsequent reviews of the manual shall be carried out annually by each such person.

(i) The operating manual shall be kept in a readily accessible location for all persons required to undergo training under paragraph (g) of this section. The operating manual and records of training shall be available for inspection by EPA or its delegated enforcement agent upon request.

(j)—(k) [Reserved]

§ 60.57a [Reserved]

§ 60.58a Compliance and performance testing.

(a) The standards under this subpart apply at all times, except during periods of start-up, shutdown, or malfunction; provided, however, that the duration of start-up, shutdown, or malfunction shall not exceed 3 hours per occurrence.

(1) The start-up period commences when the affected facility begins the continuous burning of MSW and does not include any warm-up period when the affected facility is combusting only a fossil fuel or other non-MSW fuel and no MSW is being combusted.

(2) Continuous burning is the continuous, semicontinuous, or batch feeding of MSW for purposes of waste disposal, energy production, or providing heat to the combustion system in preparation for waste disposal or energy production. The use of MSW solely to provide thermal protection of grate or hearth during the start-up period shall not be considered to be continuous burning.

(b) The following procedures and test methods shall be used to determine compliance with the emission limits for particulate matter under § 60.52a:

(1) Method 1 shall be used to select sampling site and number of traverse points.

(2) Method 3 shall be used for gas analysis.

(3) Method 5 shall be used for determining compliance with the particulate matter emission standard. The minimum sample volume shall be 1.7 cubic meters (60 cubic feet). The probe and filter holder heating systems in the sample train shall be set to provide a gas temperature no greater than 160°±14° Centigrade (320°±25° Fahrenheit). An oxygen or carbon dioxide measurement shall be obtained simultaneously with each Method 5 run.

(4) For each Method 5 run, the emission rate shall be determined using:

(i) Oxygen or carbon dioxide measurements,

(ii) Dry basis F factor, and

(iii) Dry basis emission rate calculation procedures in Method 19.

(5) An owner or operator may request that compliance be determined using carbon dioxide measurements corrected to an equivalent of 7 percent oxygen. The relationship between oxygen and carbon dioxide levels for the affected facility shall be established during the initial compliance test.

(6) The owner or operator of an affected facility shall conduct an initial compliance test for particulate matter and opacity as required under § 60.8.

(7) Method 9 shall be used for determining compliance with the opacity limit.

(8) The owner or operator of an affected facility shall install, calibrate, maintain, and operate a CEMS for measuring opacity and record the output of the system on a 6-minute average basis.

(9) Following the date the initial compliance test for particulate matter is completed or is required to be completed under § 60.8 for an affected facility located within a large MWC plant, the owner or operator shall conduct a performance test for particulate matter on an annual basis (no more than 12 calendar months following the previous compliance test).

(10) [Reserved]

(c) [Reserved]

(d) The following procedures and test methods shall be used to determine compliance with the limits for dioxin/furan emissions under § 60.53a:

(1) Method 23 shall be used for determining compliance with the dioxin/furan emission limits. The minimum sample time shall be 4 hours per test run.

(2) The owner or operator of an affected facility shall conduct an initial compliance test for dioxin/furan emissions as required under § 60.8.

(3) Following the date of the initial compliance test or the date on which the initial compliance test is required to be completed under § 60.8, the owner or operator of an affected facility located within a large MWC plant shall conduct a performance test for dioxin/furan emissions on an annual basis (no more than 12 calendar months following the previous compliance test).

(4) [Reserved]

(5) An owner or operator may request that compliance with the dioxin/furan emissions limit be determined using carbon dioxide measurements corrected to an equivalent of 7 percent oxygen. The relationship between oxygen and carbon dioxide levels for the affected facility shall be established during the initial compliance test.

(e) The following procedures and test methods shall be used for determining compliance with the sulfur dioxide limit under § 60.54a:

(1) Method 19, section 5.4, shall be used to determine the daily geometric average percent reduction in the potential sulfur dioxide emission rate.

(2) Method 19, section 4.3, shall be used to determine the daily geometric average sulfur dioxide emission rate.

(3) An owner or operator may request that compliance with the sulfur dioxide emissions limit be determined using carbon dioxide measurements corrected to an equivalent of 7 percent oxygen. The relationship between oxygen and carbon dioxide levels for the affected facility shall be established during the initial compliance test.

(4) The owner or operator of an affected facility shall conduct an initial compliance test for sulfur dioxide as required under § 60.8. Compliance with the sulfur dioxide emission limit and percent reduction is determined by using a CEMS to measure sulfur dioxide and calculating a 24-hour daily geometric mean emission rate and daily geometric mean percent reduction using Method 19 sections 4.3 and 5.4, as applicable, except as provided under paragraph (e)(5) of this section.

(5) For batch MWC's or MWC units that do not operate continuously, compliance shall be determined using a daily geometric mean of all hourly average values for the hours during the day that the affected facility is combusting MSW.

(6) The owner or operator of an affected facility shall install, calibrate, maintain, and operate a CEMS for measuring sulfur dioxide emissions discharged to the atmosphere and record the output of the system.

(7) Following the date of the initial compliance test or the date on which the initial compliance test is required to be completed under § 60.8, compliance with the sulfur dioxide emission limit or percent reduction shall be determined based on the geometric mean of the hourly arithmetic average emission rates during each 24-hour daily period measured between 12:00 mid-

night ... the following midnight using: ... S inlet and outlet data, if compliance is based on a percent reduction; or CEMS outlet data only if compliance is based on an emission limit.

(8) At a minimum, valid CEMS data shall be obtained for 75 percent of the hours per day for 75 percent of the days per month the affected facility is operated and combusting MSW.

(9) The 1-hour arithmetic averages required under paragraph (e)(7) of this section shall be expressed in parts per million (dry basis) and used to calculate the 24-hour daily geometric mean emission rates. The 1-hour arithmetic averages shall be calculated using the data points required under § 60.13(e)(2). At least two data points shall be used to calculate each 1-hour arithmetic average.

(10) All valid CEMS data shall be used in calculating emission rates and percent reductions even if the minimum CEMS data requirements of paragraph (e)(8) of this Section are not met.

(11) The procedures under § 60.13 shall be followed for installation, evaluation, and operation of the CEMS.

(12) The CEMS shall be operated according to Performance Specifications 1, 2, and 3 (appendix B of part 60).

(13) Quarterly accuracy determinations and daily calibration drift tests shall be performed in accordance with Procedure 1 (appendix F of part 60).

(14) The span value of the CEMS at the inlet to the sulfur dioxide control device is 125 percent of the maximum estimated hourly potential sulfur dioxide emissions of the MWC unit, and the span value of the CEMS at the outlet to the sulfur dioxide control device is 50 percent of the maximum estimated hourly potential sulfur dioxide emissions of the MWC unit.

(15) When sulfur dioxide emissions data are not obtained because of CEMS breakdowns, repairs, calibration checks and zero and span adjustments, emissions data shall be obtained by using other monitoring systems as approved by the Administrator or Method 19 to provide as necessary valid emission data for a minimum of 75 percent of the hours per day for 75 percent of the days per month the unit is operated and combusting MSW.

(16) Not operating a sorbent injection system for the sole purpose of testing in order to demonstrate compliance with the percent reduction standards for MWC acid gases shall not be considered a *physical change in the method of operation* under 40 CFR 52.21, or under regulations approved pursuant to 40 CFR 51.166 or 40 CFR 51.165 (a) and (b).

(f) The following procedures and test methods shall be used for determining compliance with the hydrogen chloride limits under § 60.54a:

(1) The percentage reduction in the potential hydrogen chloride emissions ($\%P_{HCl}$) is computed using the following formula:

$$\%P_{HCl} = \frac{(E_i - E_o)}{E_i} \times 100$$

where:

E_i is the potential hydrogen chloride emission rate.

E_o is the hydrogen chloride emission rate measured at the outlet of the acid gas control device.

(2) Method 26 shall be used for determining the hydrogen chloride emission rate. The minimum sampling time for Method 26 shall be 1 hour.

(3) An owner or operator may request that compliance with the hydrogen chloride emissions limit be determined using carbon dioxide measurements corrected to an equivalent of 7 percent oxygen. The relationship between oxygen and carbon dioxide levels for the affected facility shall be established during the initial compliance test.

(4) The owner or operator of an affected facility shall conduct an initial compliance test for hydrogen chloride as required under § 60.8.

(5) Following the date of the initial compliance test or the date on which the initial compliance test is required under § 60.8, the owner or operator of an affected facility located within a large MWC plant shall conduct a performance test for hydrogen chloride on an annual basis (no more than 12

calendar months following the previous compliance test).

(6) [Reserved]

(7) Not operating a sorbent injection system for the sole purpose of testing in order to demonstrate compliance with the percent reduction standards for MWC acid gases shall not be considered a *physical change in the method of operation* under 40 CFR 52.21, or under regulations approved pursuant to 40 CFR 51.166 or 40 CFR 51.165 (a) and (b).

(g) The following procedures and test methods shall be used to determine compliance with the nitrogen oxides limit under § 60.55a:

(1) Method 19, section 4.1, shall be used for determining the daily arithmetic average nitrogen oxides emission rate.

(2) An owner or operator may request that compliance with the nitrogen oxides emissions limit be determined using carbon dioxide measurements corrected to an equivalent of 7 percent oxygen. The relationship between oxygen and carbon dioxide levels for the affected facility shall be established during the initial compliance test.

(3) The owner or operator of an affected facility subject to the nitrogen oxides limit under § 60.55a shall conduct an initial compliance test for nitrogen oxides as required under § 60.8. Compliance with the nitrogen oxides emission standard shall be determined by using a CEMS for measuring nitrogen oxides and calculating a 24-hour daily arithmetic average emission rate using Method 19, section 4.1, except as specified under paragraph (g)(4) of this section.

(4) For batch MWC's or MWC's that do not operate continuously, compliance shall be determined using a daily arithmetic average of all hourly average values for the hours during the day that the affected facility is combusting MSW.

(5) The owner or operator of an affected facility subject to the nitrogen oxides emissions limit under § 60.55a shall install, calibrate, maintain, and operate a CEMS for measuring nitrogen oxides discharged to the atmosphere and record the output of the system.

(6) Following the in... compliance test or the date on which the initi... compliance test is required to be co... pleted under § 60.8, compliance wi... the emission limit for nitrogen oxid... required under § 60.55a shall be det... mined based on the arithmetic avera... of the arithmetic average hourly em... sion rates during each 24-hour dai... period measured between 12:00 mi... night and the following midnig... using CEMS data.

(7) At a minimum valid CEMS da... shall be obtained for 75 percent of t... hours per day for 75 percent of t... days per month the affected facility ... operated and combusting MSW.

(8) The 1-hour arithmetic averag... required by paragraph (g)(6) of th... section shall be expressed in parts p... million volume (dry basis) and used t... calculate the 24-hour daily arithmet... average emission rates. The 1-ho... arithmetic averages shall be calculat... using the data points required und... § 60.13(b). At least two data poin... shall be used to calculate each 1-ho... arithmetic average.

(9) All valid CEMS data must b... used in calculating emission rates eve... if the minimum CEMS data requir... ments of paragraph (g)(7) of this se... tion are not met.

(10) The procedures under § 60.1... shall be followed for installation, eva... uation, and operation of the CEMS.

(11) Quarterly accuracy determina... tions and daily calibration drift test... shall be performed in accordance wit... Procedure 1 (appendix F of part 60).

(12) When nitrogen oxides emission... data are not obtained because o... CEMS breakdowns, repairs, calibra... tion checks, and zero and span adjust... ments, emission data calculations t... determine compliance shall be mad... using other monitoring systems as ap... proved by the Administrator o... Method 19 to provide as necessar... valid emission data for a minimum o... 75 percent of the hours per day for 7... percent of the days per month th... unit is operated and combusting MSW.

(h) The following procedures shal... be used for determining complianc... with the operating standards under § 60.56a:

(1) Compliance with the carbon monoxide emission limits in § 60.56a(a)

shall be determined using a 4-hour block arithmetic average for all types of affected facilities except mass burn rotary waterwall MWC's and RDF stokers.

(2) For affected mass burn rotary waterwall MWC's and RDF stokers, compliance with the carbon monoxide emission limits in § 60.56a(a) shall be determined using a 24-hour daily arithmetic average.

(3) The owner or operator of an affected facility shall install, calibrate, maintain, and operate a CEMS for measuring carbon monoxide at the combustor outlet and record the output of the system.

(4) The 4-hour and 24-hour daily arithmetic averages in paragraphs (h)(1) and (2) of this section shall be calculated from 1-hour arithmetic averages expressed in parts per million by volume (dry basis). The 1-hour arithmetic averages shall be calculated using the data points generated by the CEMS. At least two data points shall be used to calculate each 1-hour arithmetic average.

(5) An owner or operator may request that compliance with the carbon monoxide emission limit be determined using carbon dioxide measurements corrected to an equivalent of 7 percent oxygen. The relationship between oxygen and carbon dioxide levels for the affected facility shall be established during the initial compliance test.

(6) The following procedures shall be used to determine compliance with load level requirements under § 60.56a(b):

(i) The owner or operator of an affected facility with steam generation capability recovery shall install, calibrate, maintain, and operate a steam flow meter and measure steam flow in kilograms per hour (pounds per hour) steam on a continuous basis and record the output of the monitor. Steam flow shall be calculated in 4-hour block arithmetic averages.

(ii) The method contained in ASME Power Test Codes: Test Code for Steam Generating Units, PTC 4.1 (1972), Section 4 (incorporated by reference, see § 60.17) shall be used for calculating the steam flow required under paragraph (h)(6)(i) of this section. The recommendations of Instruments and Apparatus: Measurement of Quantity of Materials, ASME Interim Supplement 19.5 (1971), chapter 4 (incorporated by reference, see § 60.17) shall be followed for design, construction, installation, calibration, and use of nozzles and orifices.

(iii) The owner or operator of an affected facility without heat recovery shall:

(A) [Reserved]

(7) To determine compliance with the maximum particulate matter control device temperature requirements under § 60.56a(c), the owner or operator of an affected facility shall install, calibrate, maintain, and operate a device for measuring temperature of the flue gas stream at the inlet to the final particulate matter control device on a continuous basis and record the output of the device. Temperature shall be calculated in 4-hour block arithmetic averages.

(8) Maximum demonstrated MWC unit load shall be determined during the initial compliance test for dioxins/furans and each subsequent performance test during which compliance with the dioxin/furan emission limit under § 60.53a is achieved. Maximum demonstrated MWC unit load shall be the maximum 4-hour arithmetic average load achieved during the most recent test during which compliance with the dioxin/furan limit was achieved.

(9) The maximum demonstrated particulate matter control device temperature shall be determined during the initial compliance test for dioxins/furans and each subsequent performance test during which compliance with the dioxin/furan emission limit under § 60.53a is achieved. Maximum demonstrated particulate matter control device temperature shall be the maximum 4-hour arithmetic average temperature achieved at the final particulate matter control device inlet during the most recent test during which compliance with the dioxin/furan limit was achieved.

(10) At a minimum, valid CEMS data for carbon monoxide, steam flow, and particulate matter control device inlet temperature shall be obtained 75 percent of the hours per day for 75 percent of the days per month the affected facility is operated and combusting MSW.

(11) All valid data must be used in calculating the parameters specified under paragraph (h) of this section even if the minimum data requirements of paragraph (h)(10) of this section are not met.

(12) Quarterly accuracy determinations and daily calibration drift tests for carbon monoxide CEMS shall be performed in accordance with Procedure 1 (appendix F).

(i) [Reserved]

(j) The following procedures shall be used for calculating *MWC unit capacity* as defined under § 60.51a:

(1) For MWC units capable of combusting MSW continuously for a 24-hour period, MWC unit capacity, in megagrams per day (tons per day) of MSW combusted, shall be calculated based on 24 hours of operation at the maximum design charging rate. The design heating values under paragraph (j)(4) of this section shall be used in calculating the design charging rate.

(2) For batch MWC units, MWC unit capacity, in megagrams per day (tons per day) of MSW combusted, shall be calculated as the maximum design amount of MSW that can be charged per batch multiplied by the maximum number of batches that could be processed in a 24-hour period. The maximum number of batches that could be processed in a 24-hour period is calculated as 24 hours divided by the design number of hours required to process one batch of MSW, and may include fractional batches.[1] The design heating values under paragraph (j)(4) of this section shall be used in calculating the MWC unit capacity in megagrams per day (tons per day) of MSW

(3) For cofired combustors, as defined under § 60.51a, MWC unit capacity is the maximum daily amount of MSW or RDF specified in a Federally enforceable permit that can be combusted in the cofired combustor, expressed in megagrams per day (tons per day) of MSW.

(4) MWC unit capacity shall be calculated using a design heating value of 10,500 kilojoules per kilogram (4,500 British thermal units per pound) for all MSW except medical waste and 19,800 kilojoules per kilogram (8,500 British thermal units per pound) for medical waste. If an affected MWC unit fires both medical waste and other MSW, either the procedure under (j)(4) (i) or (ii) of this section shall be used to determine the design heating value.

(i) The design heating value may be prorated using the following equation

$$HV_D = 10{,}500 \frac{MSW}{MSW+Med} + 19{,}800 \frac{Med}{MSW+Med}$$

where:

HV_D=design heating value in kilojoules per kilogram

MSW=amount of non-medical MSW fired (daily basis)

Med=amount of medical waste fired (daily basis)

If this equation is used, records must be kept of the daily amounts of medical waste and other MSW combusted.

(ii) The owner or operator of an affected MWC firing both medical waste and other MSW may elect to assume a design heating value of 10,500 kilojoules per kilogram (4,500 British thermal units per pound) for all MSW and medical waste fired. If this assumption is used, records of the daily amount of MSW and medical waste combusted are not required to be kept.

[1] For example, if one batch requires 16 hours, then 24/16, or 1.5 batches, could be combusted in a 24-hour period.

§ 60.59a Reporting and recordkeeping requirements.

(a) The owner or operator of an affected facility located at an MWC plant with a capacity greater than 225 megagrams per day (250 tons per day shall prov... notification of intent to construct and of planned initial start-up date and the type(s) of fuels that they plan to combust in the affected facility. The MWC unit capacity and MWC plant capacity and supporting capacity calculations shall be provided at the time of the notification of construction.

(1) At the time of notification of construction, owners or operators of cofired combustors must provide estimates of the types and amounts of each fuel they plan to combust and the date on which they plan to start combusting MSW or RDF and shall submit a copy of a Federally-enforceable permit limiting the maximum amount of MSW that may be combusted in the cofired combustor in any single day (midnight to midnight), expressed in percent of the aggregate fuel feed stream by weight.

(2) [Reserved]

(b) The owner or operator of an affected facility located within a small or large MWC plant and subject to the standards under § 60.52a, § 60.53a, § 60.54a, § 60.55a, § 60.56a, or § 60.57a shall maintain records of the following information for each affected facility for a period of at least 2 years:

(1) Calendar date.

(2) The emission rates and parameters measured using CEMS as specified under (b)(2) (i) and (ii) of this section:

(i) The following measurements shall be recorded in computer-readable format and on paper:

(A) All 6-minute average opacity levels required under § 60.58a(b).

(B) All 1 hour average sulfur dioxide emission rates at the inlet and outlet of the acid gas control device if compliance is based on a percent reduction, or at the outlet only if compliance is based on the outlet emission limit, as specified under § 60.58a(e).

(C) All 1-hour average nitrogen oxides emission rates as specified under § 60.58a(g).

(D) All 1-hour average carbon monoxide emission rates, MWC unit load measurements, and particulate matter control device inlet temperatures as specified under § 60.58a(h).

(ii) The following average rates shall be computed and recorded:

(A) All 24-hour daily geometric average percent reductions in sulfur dioxide emissions and all 24-hour daily geometric average sulfur dioxide emission rates as specified under § 60.58a(e).

(B) All 24-hour daily arithmetic average nitrogen oxides emission rates as specified under § 60.58a(g).

(C) All 4-hour block or 24-hour daily arithmetic average carbon monoxide emission rates, as applicable, as specified under § 60.58a(h).

(D) All 4-hour block arithmetic average MWC unit load levels and particulate matter control device inlet temperatures as specified under § 60.58a(h).

(3) Identification of the operating days when any of the average emission rates, percent reductions, or operating parameters specified under paragraph (b)(2)(ii) of this section or the opacity level exceeded the applicable limits, with reasons for such exceedances as well as a description of corrective actions taken.

(4) Identification of operating days for which the minimum number of hours of sulfur dioxide or nitrogen oxides emissions or operational data (carbon monoxide emissions, unit load, particulate matter control device temperature) have not been obtained, including reasons for not obtaining sufficient data and a description of corrective actions taken.

(5) Identification of the times when sulfur dioxide or nitrogen oxides emission or operational data (carbon monoxide emissions, unit load, particulate matter control device temperature) have been excluded from the calculation of average emission rates or parameters and the reasons for excluding data.

(6) The results of daily sulfur dioxide, nitrogen oxides, and carbon monoxide CEMS drift tests and accuracy assessments as required under appendix F, Procedure 1.

(7) The results of all annual performance tests conducted to determine compliance with the particulate matter, dioxin/furan and hydrogen chloride limits. For all annual dioxin/furan tests, the maximum demonstrated MWC unit load and maximum demonstrated particulate matter control device temperature shall be recorded along with supporting calculations.

(8)—(13) [Reserved]

(14) For cofired combustors having an MWC unit capacity greater than 225 megagrams per day (250 tons per day) of MSW, the weight of MSW and each other fuel combusted on a daily basis.

(15) For combustors firing both medical waste and other MSW, the amount of non-medical MSW and the amount of medical waste combusted on a daily basis, unless it is assumed that the total heat input to the combustor is from MSW with a design heating value of 10,500 kilojoules per kilogram (4,500 British thermal units per pound).

(c) Following the initial compliance test as required under §§ 60.8 and 60.58a, the owner or operator of an affected facility located within a large MWC plant shall submit the initial compliance test data, the performance evaluation of the CEMS using the applicable performance specifications in appendix B, and the maximum demonstrated MWC unit load and maximum demonstrated particulate matter control device temperature established during the dioxin/furan compliance test.

(d) [Reserved]

(e) The owner or operator of an affected facility located within a large MWC plant shall submit quarterly compliance reports for sulfur dioxide, nitrogen oxide (if applicable), carbon monoxide, load level, and particulate matter control device temperature to the Administrator containing the information recorded under paragraphs (b)(1), (2)(ii), (3), (4), (5), and (6) of this section for each pollutant or parameter. The hourly average values recorded under paragraph (b)(2)(i) of this section are not required to be included in the quarterly reports. Combustors firing a mixture of medical waste and other MSW shall also provide the information under paragraph (b)(15) of this section, as applicable, in each quarterly report. Such reports shall be postmarked no later than the 30th day following the end of each calendar quarter.

(f) The owner or operator of an affected facility located within a large MWC plant shall su... quarterly excess emission reports, as applicable for opacity. The quarterly excess emission reports shall include all information recorded under paragraph (b)(3) of this section which pertains to opacity and a listing of the 6-minute average opacity levels recorded under paragraph (b)(2)(i)(A) of this section for all periods when such 6-minute average levels exceeded the opacity limit under § 60.52a. The quarterly report shall also list the percent of the affected facility operating time for the calendar quarter that the opacity CEMS was operating and collecting valid data. Such excess emission reports shall be postmarked no later than the 30th day following the end of each calendar quarter.

(g) The owner or operator of an affected facility located within a large MWC plant shall submit reports to the Administrator of all annual performance tests for particulate matter, dioxin/furan, and hydrogen chloride as recorded under paragraph (b)(7) of this section, as applicable, from the affected facility. For each annual dioxin/furan compliance test, the maximum demonstrated MWC unit load and maximum demonstrated particulate matter control device temperature shall be reported. Such reports shall be submitted when available and in no case later than the date of required submittal of the quarterly report specified under paragraph (e) of this section covering the calendar quarter following the quarter during which the test was conducted.

(h) [Reserved]

(i) Records of CEMS data for opacity, sulfur dioxide, nitrogen oxides, and carbon monoxide, load level data, and particulate matter control device temperature data shall be maintained for at least 2 years after date of recordation and be made available for inspection upon request.

(j) Records showing the names of persons who have completed review of the operating manual, including the date of the initial review and all subsequent annual reviews, shall be maintained for at least 2 years after date of review and be made available for inspection upon request.

(k)—(l) [Reserved]

(m) The owner or operator of a co-fired combustor located within a plant having an MWC plant capacity, as determined under §§ 60.51a and 60.58a(j)(3), greater than 225 megagrams per day (250 tons per day) shall submit quarterly reports of the daily weights of MSW and each other fuel fired as recorded under paragraph (b)(14) of this section. Such reports shall be postmarked no later than the 30th day following the end of each calendar quarter.

Subpart F—Standards of Performance for Portland Cement Plants

§ 60.60 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities in portland cement plants: Kiln, clinker cooler, raw mill system, finish mill system, raw mill dryer, raw material storage, clinker storage, finished product storage, conveyor transfer points, bagging and bulk loading and unloading systems.

(b) Any facility under paragraph (a) of this section that commences construction or modification after August 17, 1971, is subject to the requirements of this subpart.

[42 FR 37936, July 25, 1977]

§ 60.61 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) *Portland cement plant* means any facility manufacturing portland cement by either the wet or dry process.

(b) *Bypass* means any system that prevents all or a portion of the kiln or clinker cooler exhaust gases from entering the main control device and ducts the gases through a separate control device. This does not include emergency systems designed to duct exhaust gases directly to the atmosphere in the event of a malfunction of any control device controlling kiln or clinker cooler emissions.

(c) *Bypass stack* means the stack that vents exhaust gases to the atmosphere from the bypass control device.

(d) *Monovent* means an exhaust configuration of a building or emission control device (e.g., positive-pressure fabric filter) that extends the length of the structure and has a width very small in relation to its length (i.e., length to width ratio is typically greater than 5:1). The exhaust may be an open vent with or without a roof, louvered vents, or a combination of such features.

[36 FR 24877, Dec. 23, 1971, as amended at 39 FR 20793, June 13, 1974; 53 FR 50363, Dec. 14, 1988]

§ 60.62 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any kiln any gases which:

(1) Contain particulate matter in excess of 0.15 kg per metric ton of feed (dry basis) to the kiln (0.30 lb per ton).

(2) Exhibit greater than 20 percent opacity.

(b) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any clinker cooler any gases which:

(1) Contain particulate matter in excess of 0.050 kg per metric ton of feed (dry basis) to the kiln (0.10 lb per ton).

(2) Exhibit 10 percent opacity, or greater.

(c) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility other than the kiln and clinker cooler any gases which exhibit 10 percent opacity, or greater.

[39 FR 20793, June 14, 1974, as amended at 39 FR 39874, Nov. 12, 1974; 40 FR 46258, Oct. 6, 1975]

§ 60.63 Monitoring of operations.

(a) The owner or operator of any portland cement plant subject to the provisions of this part shall record the daily production rates and kiln feed rates.

(b) Except as provided in paragraph (c) of this section, each owner or operator of a kiln or clinker cooler that is subject to the provisions of this subpart shall install, calibrate, maintain, and operate in accordance with § 60.13 a continuous opacity monitoring system to measure the opacity of emissions discharged into the atmosphere from any kiln or clinker cooler. Except as provided in paragraph (c) of this section, a continuous opacity monitoring system shall be installed on each stack of any multiple stack device controlling emissions from any kiln or clinker cooler. If there is a separate bypass installed, each owner or operator of a kiln or clinker cooler shall also install, calibrate, maintain, and operate a continuous opacity monitoring system on each bypass stack in addition to the main control device stack. Each owner or operator of an affected kiln or clinker cooler for which the performance test required under § 60.8 has been completed on or prior to December 14, 1988, shall install the continuous opacity monitoring system within 180 days after December 14, 1988.

(c) Each owner or operator of a kiln or clinker cooler subject to the provisions of this subpart using a positive-pressure fabric filter with multiple stacks, or a negative-pressure fabric filter with multiple stacks, or an electrostatic precipitator with multiple stacks may, in lieu of installing the continuous opacity monitoring system required by § 60.63(b), monitor visible emissions at least once per day by using a certified visible emissions observer. If the control device exhausts gases through a monovent, visible emission observations in lieu of a continuous opacity monitoring system are required. These observations shall be taken in accordance with EPA Method 9. Visible emissions shall be observed during conditions representative of normal operation. Observations shall be recorded for at least three 6-minute periods each day. In the event that visible emissions are observed for a number of emission sites from the control device with multiple stacks, Method 9 observations shall be r[illegible] ed for the emission site with the [illegible]est opacity. All records of visible [illegible]sions shall be maintained for a p[illegible] of 2 years.

(d) For the purpose of reports [illegible] § 60.65, periods of excess emis[illegible] that shall be reported are defin[illegible] all 6-minute periods during whic[illegible] average opacity exceeds that all[illegible] by § 60.62(a)(2) or § 60.62(b)(2).

(e) The provisions of paragraph[illegible] (b), and (c) of this section appl[illegible] kilns and clinker coolers for w[illegible] construction, modification, or r[illegible]struction commenced after Augus[illegible] 1971.

(Approved by the Office of Manage[illegible] and Budget under control number [illegible] 0025.)

[36 FR 24877, Dec. 23, 1971, as amend[illegible] 53 FR 50363, Dec. 14, 1988]

§ 60.64 Test methods and procedures.

(a) In conducting the perform[illegible] tests required in § 60.8, the owne[illegible] operator shall use as reference m[illegible]ods and procedures the test met[illegible] in appendix A of this part or o[illegible] methods and procedures as speci[illegible] in this section, except as provide[illegible] § 60.8(b).

(b) The owner or operator shall [illegible]termine compliance with the part[illegible]late matter standard in § 60.62 as [illegible]lows:

(1) The emission rate (E) of part[illegible]late matter shall be computed for e[illegible] run using the following equation:

$$E=(c_s Q_{sd})/(P K)$$

where:

E=emission rate of particulate matter, [illegible] metric ton (lb/ton) of kiln feed.

c_s=concentration of particulate matter, [illegible] dscm (g/dscf).

Q_{sd}=volumetric flow rate of effluent [illegible] dscm/hr (dscf/hr).

P=total kiln feed (dry basis) rate, me[illegible] ton/hr (ton/hr).

K=conversion factor, 1000 g/kg (453.6 g/[illegible]

(2) Method 5 shall be used to det[illegible]mine the particulate matter conc[illegible]tration (c_s) and the volumetric fl[illegible] rate (Q_{sd}) of the effluent gas. The sampling time and sample volu[illegible] for each run shall be at least 60 m[illegible]utes and 0.85 dscm (30.0 dscf) for t[illegible]

Appendix 4

Clean Air Act, Section 129. Solid Waste Combustion.

paragraph (1) and (2), and the Administrator shall approve any such more stringent requirements submitted as part of an implementation plan.

[PL 95-95, August 7, 1977]

SOLID WASTE COMBUSTION

Sec. 129.(a) New Source Performance Standards.—(1) In General.—(A) The Administrator shall establish performance standards and other requirements pursuant to section 111 and this section for each category of solid waste incineration units. Such standards shall include emissions limitations and other requirements applicable to new units and guidelines (under section 111(d) and this section) and other requirements applicable to existing units.

(B) Standards under section 111 and this section applicable to solid waste incineration units with capacity greater than 250 tons per day combusting municipal waste shall be promulgated not later than 12 months after the date of enactment of the Clean Air Act Amendments of 1990. Nothing in this subparagraph shall alter any schedule for the promulgation of standards applicable to such units under section 111 pursuant to any settlement and consent decree entered by the Administrator before the date of enactment of the Clean Air Act Amendments of 1990: *Provided*, That, such standards are subsequently modified pursuant to the schedule established in this subparagraph to include each of the requirements of this section.

(C) Standards under section 111 and this section applicable to solid waste incineration units with capacity equal to or less than 250 tons per day combusting municipal waste and units combusting hospital waste, medical waste and infectious waste shall be promulgated not later than 24 months after the date of enactment of the Clean Air Act Amendments of 1990.

(D) Standards under section 111 and this section applicable to solid waste incineration units combusting commercial or industrial waste shall be proposed not later than 36 months after the date of enactment of the Clean Air Act Amendments of 1990 and promulgated not later than 48 months after such date of enactment.

(E) Not later than 18 months after the date of enactment of the Clean Air Act Amendments of 1990, the Administrator shall publish a schedule for the promulgation of standards under section 111 and this section applicable to other categories of solid waste incineration units.

(2) Emissions Standard.—Standards applicable to solid waste incineration units promulgated under section 111 and this section shall reflect the maximum degree of reduction in emissions of air pollutants listed under section (a)(4) that the Administrator, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable for new or existing units in each category. The Administrator may distinguish among classes, types (including mass-burn, refuse-derived fuel, modular and other types of units), and sizes of units within a category in establishing such standards. The degree of reduction in emissions that is deemed achievable for new units in a category shall not be less stringent than the emissions control that is achieved in practice by the best controlled similar unit, as determined by the Administrator. Emissions standards for existing units in a category may be less stringent than standards for new units in the same category but shall not be less stringent than the average emissions limitation achieved by the best performing 12 percent of units in the category (excluding units which first met lowest achievable emissions rates 18 months before the date such standards are proposed or 30 months before the date such standards are promulgated, whichever is later.)

(3) Control Methods And Technologies.—Standards under section 111 and this section applicable to solid waste incineration units shall be based on methods and technologies for removal or destruction of pollutants before, during, or after combustion, and shall incorporate for new units siting requirements that minimize, on a site specific basis, to the maximum extent practicable, potential risks to public health or the environment.

(4) Numerical Emissions Limitations.—The performance standards promulgated under section 111 and this section and applicable to solid waste incineration units shall specify numerical emission limitations for the following substances or mixtures: particulate matter (total and fine), opacity (as appropriate), sulfur dioxide, hydrogen chloride, oxides of nitrogen, carbon monoxide, lead, cadmium, mercury, and dioxins and dibenzofurans. The Administrator may promulgate numerical emissions limitations or provide for the monitoring of postcombustion concentrations of surrogate substances, parameters or periods of residence time in excess of stated temperatures with respect to pollutants other than those listed in this paragraph.

(5) Review And Revision.—Not later than 5 years following the initial promulgation of any performance standards and other requirements under this section and section 111 applicable to a category of solid waste incineration units, and at 5 year intervals thereafter, the Administrator shall review, and in accordance with this section and section 111, revise such standards and requirements.

(b) Existing Units.—(1) Guidelines.—Performance standards under this section and section 111 for solid waste incineration units shall include guidelines promulgated pursuant to section 111(d) and this section applicable to existing units. Such guidelines shall include, as provided in this section, each of the elements required by subsection (a) (emissions limitations, notwithstanding any restriction in section 111(d) regarding issuance of such limitations), subsection (c) (monitoring), subsection (d) (operator training), subsection (e) (permits), and subsection (h)(4) (residual risk).

(2) State Plans.—Not later than 1 year after the Administrator promulgates guidelines for a category of solid waste incineration units, each State in which units in the category are operating shall submit to the Administrator a plan to implement and enforce the guidelines with respect to such units. The State plan shall be at least as protective as the guidelines promulgated by the Administrator and shall provide that each unit subject to the guidelines shall be in compliance with all requirements of this section not later than 3 years after the State plan is approved by the Administrator but not later than 5 years after the guidelines were promulgated. The Administrator shall approve or disapprove any State plan within 180 days of the submission, and if a plan is disapproved, the Administrator shall state the reasons for disapproval in writing. Any State may modify and resubmit a plan which has been disapproved by the Administrator.

(3) Federal Plan. — The Administrator shall develop, implement and enforce a plan for existing solid waste incineration units within any category located in any State which has not submitted an approvable plan under this subsection with respect to units in such category within 2 years after the date on which the Administrator promulgated the relevant guidelines. Such plan shall assure that each unit subject to the plan is in compliance with all provisions of the guidelines not later than 5 years after the date the relevant guidelines are promulgated.

(c) Monitoring. — The Administrator shall, as part of each performance standard promulgated pursuant to subsection (a) and section 111, promulgate regulations requiring the owner or operator of each solid waste incineration unit—

(1) to monitor emissions from the unit at the point at which such emissions are emitted into the ambient air (or within the stack, combustion chamber or pollution control equipment, as appropriate) and at such other points as necessary to protect public health and the environment;

(2) to monitor such other parameters relating to the operation of the unit and its pollution control technology as the Administrator determines are appropriate; and

(3) to report the results of such monitoring.

Such regulations shall contain provisions regarding the frequency of monitoring, test methods and procedures validated on solid waste incineration units, and the form and frequency of reports containing the results of monitoring and shall require that any monitoring reports or test results indicating an exceedance of any standard under this section shall be reported separately and in a manner that facilitates review for purposes of enforcement actions. Such regulations shall require that copies of the results of such monitoring be maintained on file at the facility concerned and that copies shall be made available for inspection and copying by interested members of the public during business hours.

(d) Operator Training. — Not later than 24 months after the enactment of the Clean Air Act Amendments of 1990, the Administrator shall develop and promote a model State program for the training and certification of solid waste incineration unit operators and high-capacity fossil fuel fired plant operators. The Administrator may authorize any State to implement a model program for the training of solid waste incineration unit operators and high capacity fossil fuel fired plant operators, if the State has adopted a program which is at least as effective as the model program developed by the Administrator. Beginning on the date 36 months after the date on which performance standards and guidelines are promulgated under subsection (a) and section 111 for any category of solid waste incineration units it shall be unlawful to operate any unit in the category unless each person with control over processes affecting emissions from such unit has satisfactorily completed a training program meeting the requirements established by the Administrator under this subsection.

(e) Permits. — Beginning (1) 36 months after the promulgation of a performance standard under subsection (a) and section 111 applicable to a category of solid waste incineration units, or (2) the effective date of a permit program under title V in the State in which the unit is located, whichever is later, each unit in the category shall operate pursuant to a permit issued under this subsection and title V. Permits required by this subsection may be renewed according to the provisions of title V. Notwithstanding any other provision of this Act, each permit for a solid waste incineration unit combusting municipal waste issued under this Act shall be issued for a period of up to 12 years and shall be reviewed every 5 years after date of issuance or reissuance. Each permit shall continue in effect after the date of issuance until the date of termination, unless the Administrator or State determines that the unit is not in compliance with all standards and conditions contained in the permit. Such determination shall be made at regular intervals during the term of the permit, such intervals not to exceed 5 years, and only after public comment and public hearing. No permit for a solid waste incineration unit may be issued under this Act by an agency, instrumentality or person that is also responsible, in whole or part, for the design and construction or operation of the unit. Notwithstanding any other provision of this subsection, the Administrator or the State shall require the owner or operator of any unit to comply with emissions limitations or implement any other measures, if the Administrator or the State determines that emissions in the absence of such limitations or measures may reasonably be anticipated to endanger public health or the environment. The Administrator's determination under the preceding sentence is a discretionary decision.

(f) Effective Date and Enforcement. — (1) New Units. — Performance standards and other requirements promulgated pursuant to this section and section 111 and applicable to new solid waste incineration units shall be effective as of the date 6 months after the date of promulgation.

(2) Existing Units. — Performance standards and other requirements promulgated pursuant to this section and section 111 and applicable to existing solid waste incineration units shall be effective as expeditiously as practicable after approval of a State plan under subsection (b)(2) (or promulgation of a plan by the Administrator under subsection (b)(3)) but in no event later than 3 years after the State plan is approved or 5 years after the date such standards or requirements are promulgated, whichever is earlier.

Feb 1991

Feb 1991

(3) Prohibition. — After the effective date of any performance standard, emission limitation or other requirement promulgated pursuant to this section and section 111, it shall be unlawful for any owner or operator of any solid waste incineration unit to which such standard, limitation or requirement applies to operate such unit in violation of such limitation, standard or requirement or for any other person to violate an applicable requirement of this section.

(4) Coordination With Other Authorities. — For purposes of sections 111(e), 113, 114, 116, 120, 303, 304, 307 and other provisions for the enforcement of this Act, each performance standard, emission limitation or other requirement established pursuant to this section by the Administrator or a State or local government, shall be treated in the same manner as a standard of performance under section 111 which is an emission limitation.

(g) Definitions. — For purposes of section 306 of the Clean Air Act Amendments of 1990 and this section only—

(1) Solid Waste Incineration Unit.— The term 'solid waste incineration unit' means a distinct operating unit of any facility which combusts any solid waste

material from commercial or industrial establishments or the general public (including single and multiple residences, hotels, and motels). Such term does not include incinerators or other units required to have a permit under section 3005 of the Solid Waste Disposal Act. The term 'solid waste incineration unit' does not include (A) materials recovery facilities (including primary or secondary smelters) which combust waste for the primary purpose of recovering metals, (B) qualifying small power production facilities, as defined in section 3(17)(C) of the Federal Power Act (16 U.S.C. 769(17)(C)), or qualifying cogeneration facilities, as defined in section 3(18)(B) of the Federal Power Act (16 U.S.C. 796(18)(B)), which burn homogeneous waste (such as units which burn tires or used oil, but not including refuse-derived fuel) for the production of electric energy or in the case of qualifying cogeneration facilities which burn homogeneous waste for the production of electric energy and steam or forms of useful energy (such as heat) which are used for industrial, commercial, heating or cooling purposes, or (C) air curtain incinerators provided that such incinerators only burn wood wastes, yard wastes and clean lumber and that such air curtain incinerators comply with opacity limitations to be established by the Administrator by rule.

(2) New Solid Waste Incineration Unit.—The term 'new solid waste incineration unit' means a solid waste incineration unit the construction of which is commenced after the Administrator proposes requirements under this section establishing emissions standards or other requirements which would be applicable to such unit or a modified solid waste incineration unit.

(3) Modified Solid Waste Incineration Unit.—The term 'modified solid waste incineration unit' means a solid waste incineration unit at which modifications have occurred after the effective date of a standard under subsection (a) if (A) the cumulative cost of the modifications, over the life of the unit, exceed 50 per centum of the original cost of construction and installation of the unit (not including the cost of any land purchased in connection with such construction or installation) updated to current costs, or (B) the modification is a physical change in or change in the method of operation of the unit which increases the amount of any air pollutant emitted by the unit for which standards have been established under this section or section 111.

(4) Existing Solid Waste Incineration Unit. — The term 'existing solid waste incineration unit' means a solid waste unit which is not a new or modified solid waste incineration unit.

(5) Municipal Waste. — The term 'municipal waste' means refuse (and refuse-derived fuel) collected from the general public and from residential, commercial, institutional, and industrial sources consisting of paper, wood, yard wastes, food wastes, plastics, leather, rubber, and other combustible materials and non-combustible materials such as metal, glass and rock, provided that: (A) the term does not include industrial process wastes or medical wastes that are segregated from such other wastes; and (B) an incineration unit shall not be considered to be combusting municipal waste for purposes of section 111 or this section if it combusts a fuel feed stream, 30 percent or less of the weight of which is comprised, in aggregate, of municipal waste.

(6) Other Terms.—The terms 'solid waste' and 'medical waste' shall have the meanings established by the Administrator pursuant to the Solid Waste Disposal Act.

(h) Other Authority.—

(1) State Authority.—Nothing in this section shall preclude or deny the right of any State or political subdivision thereof to adopt or enforce any regulation, requirement, limitation or standard relating to solid waste incineration units that is more stringent than a regulation, requirement, limitation or standard in effect under this section or under any other provision of this Act.

(2) Other Authority Under This Act.—Nothing in this section shall diminish the authority of the Administrator or a State to establish any other requirements applicable to solid waste incineration units under any other authority of law, including the authority to establish for any air pollutant a national ambient air quality standard, except that no solid waste incineration unit subject to performance standards under this section and section 111 shall be subject to standards under section 112(d) of this Act.

emission standards

(3) Residual Risk.—The Administrator shall promulgate standards under section 112(f) for a category of solid waste incineration units, if promulgation of such standards is required under section 112(f). For purposes of this preceding sentence only—

(A) the performance standards under subsection (a) and section 111 applicable to a category of solid waste incineration units shall be deemed standards under section 112(d)(2), and

(B) the Administrator shall consider and regulate, if required, the pollutants listed under subsection (a)(4) and no others.

(4) Acid Rain.—A solid waste incineration unit shall not be a utility unit as defined in title IV: *Provided*, That, more than 80 per centum of its annual average fuel consumption measured on a Btu basis, during a period or periods to be determined by the Administrator, is from a fuel (including any waste burned as a fuel) other than a fossil fuel.

(5) Requirements Of Parts C and D.—No requirement of an applicable implementation plan under section 165 (relating to construction of facilities in regions identified pursuant to section 107(d)(1)(A)(ii) or (iii) or under section 172(c)(5) (relating to permits for construction and operation in nonattainment areas) may be used to weaken the standards in effect under this section.

[Sec. 129 added by PL 101-549]

[*Editor's note:* Sec. 305 of PL 101-549 provides:

"(c) Review Of Acid Gas Scrubbing Requirements.—Prior to the promulgation of any performance standard for solid waste incineration units combusting municipal waste under section 111 or section 129 of the Clean Air Act, the Administrator shall review the availability of acid gas scrubbers as a pollution control technology for small new units and for existing units (as defined in 54 Federal Register 52190 (December 20, 1989), taking into account the provisions of subsection (a)(2) of section 129 of the Clean Air Act."

Sec. 306. of PL 101-549 provides:

"For a period of 2 years after the date of enactment of the Clean Air Act Amendments of 1990, ash from solid waste incineration units burning municipal waste shall not be regulated by the Administrator of the Environmental Protection Agency pursuant to section 3001 of the Solid Waste Disposal Act. Such reference and limitation shall not be construed to prejudice, endorse or otherwise affect any activity by the Administrator following the 2-year period from the date of enactment of the Clean Air Act Amendments of 1990."]

EMISSION FACTORS

Sec. 130. Within 6 months after enactment of the Clean Air Act Amendments of 1990, and at least every 3 years thereafter, the Administrator shall review and, if necessary, revise, the methods ('emission factors') used for purposes of this Act to estimate the quantity of emissions of carbon monoxide, volatile organic compounds, an oxides of nitrogen from sources of such air pollutants (including area sources and mobile sources). In addition, the Administrator shall establish emission factors for sources for which no such methods have previously been established by the Administrator. The Administrator shall permit any person to demonstrate improved emissions estimating techniques, and following approval of such techniques, the Administrator shall authorize the use of such techniques. Any such technique may be approved only after appropriate public participation. Until the Administrator has completed the revision required by this section, nothing in this section shall be construed to affect the validity of emission factors established by the Administrator before the date of the enactment of the Clean Air Act Amendments of 1990.

[Sec. 130 added by PL 101-549]

LAND USE AUTHORITY

Sec. 131. Nothing in this Act constitutes an infringement on the existing authority of counties and cities to plan or control land use, and nothing in this Act provides or transfers authority over such land use.

[Sec. 131 added by PL 101-549]

Part B — Ozone Protection

[Repealed by PL 101-549]

Part C — Prevention of Significant Deterioration of Air Quality

[PL 95-95, August 7, 1977]

SUBPART I

PURPOSES

Sec. 160. The purposes of this part are as follows:

(1) to protect public health and welfare from any actual or potential adverse effect which in the Administrator's judgment may reasonably be anticipated to occur from air pollution (or from exposures to pollutants in other media, which pollutants originate as emissions to the ambient air), notwithstanding attainment and maintenance of all national ambient air quality standards;

(2) to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural recreational, scenic, or historic value;

(3) to insure that economic growth will occur in a manner consistent with the preservation of existing clean air resources;

(4) to assure that emissions from any source in any State will not interfere with any portion of the applicable implementation plan to prevent significant deterioration of air quality for any other State; and

(5) to assure that any decision to permit increased air pollution in any area to which this section applies is made only after careful evaluation of all the consequences of such a decision and after adequate procedural opportunities for informed public participation for the decisionmaking process.

PLAN REQUIREMENTS

Sec. 161. In accordance with the policy of section 101(b)(1), each applicable implementation plan shall contain emission limitations and such other measures as may be necessary, as determined under regulations promulgated under this part, to prevent significant deterioration of air quality in each region (or portion thereof) designated pursuant to section 107 as attainment or unclassifiable.

[Sec. 161 amended by PL 101-549]

INITIAL CLASSIFICATIONS

Sec. 162.(a) Upon the enactment of this part, all—

(1) international parks,

(2) national wilderness areas which exceed 5,000 acres in size,

(3) national memorial parks which exceed 5,000 acres in size, and

(4) national parks which exceed six thousand acres in size, and which are in existence on the date of enactment of the Clean Air Act Amendments of 1977 shall be class I areas and may not be redesignated. All areas which were redesignated as class I under regulations promulgated before such date of enactment shall be class I areas which may be redesignated as provided in this part.
The extent of the areas designated as Class I under this section shall conform to any changes in the boundaries of such areas which have occurred subsequent to the date of the enactment of the Clean Air Act Amendments of 1977, or which may occur subsequent to the date of the enactment of the Clean Air Act Amendments of 1990.

[Sec. 162(a) amended by PL 101-549]

(b) All areas in such State designated pursuant to section 107(d) as attainment or unclassifiable which are not established as class I under subsection (a) shall be class II areas unless redesignated under section 164.

[Sec. 162(b) amended by PL 101-549]

INCREMENTS AND CEILINGS

Sec. 163.(a) In the case of sulfur oxides and particulates, each applicable implementation plan shall contain measures assuring that maximum allowable increases over baseline concentrations of, and maximum allowable concentrations of, such pollutant shall not be exceeded. In the case of any maximum allowable increase (except an allowable increase specified under 165(d)(2)(C)(iv)) for a pollutant based on concentrations permitted under national ambient air quality standards for any period other than an annual period, such regulations shall permit such maximum allowable increase to be exceeded during one such period per year.

(b)(1) For any class I area, the maximum allowable increase in concentrations of sulfur dioxide and particulate matter over the baseline concentration of such pollutants shall not exceed the following amounts:

Pollutants	Maximum allowable increase (in micrograms per cubic meter)
Particulate matter:	
Annual geometric mean	5
Twenty-four-hour maximum	10
Sulfur dioxide:	
Annual arithmetic mean	2
Twenty-four-hour maximum	5
Three-hour maximum	25

Appendix 5

Memorandum from Ms. Nancy J. Bode, Assistant Attorney General to Ms. Kathleen Winters, Special Assistant Attorney General. Re: BCA Incinerator. March 18, 1993.

to guard against theft and diversion of controlled substances in compliance with security requirements set forth in 21 C.F.R. pts. 1301.72-1301.76. 21 C.F.R. pt. 1301.71.

Because it is illegal for anyone other than a person or entity registered with the Drug Enforcement Administration to possess the drugs, the drugs could not be provided to a private waste disposal service for disposal. Transporting the contraband to another facility for disposal would also risk diversion of the drugs. It is, therefore, necessary for the BCA to dispose of the drug contraband. It is reasonable to exempt the BCA from the Class IV incinerator ban given the unique need the BCA has for on-site disposal services.

INFECTIOUS WASTE DISPOSAL

The BCA also disposes of evidence obtained in other criminal cases. For example, blood soaked materials need to be disposed of after being analyzed by the BCA. Similarly, the BCA Laboratory conducts testing on blood and urine samples for alcohol concentration levels in drunk driving cases.

The disposal by the BCA of the infectious waste generated by the BCA's analysis of evidence in criminal cases is complicated by the data practice status of the evidence. The BCA is a law enforcement agency governed by Minn. Stat. § 13.82 (1992). While the criminal investigation is active, the data collected or created by the BCA is confidential. Minn. Stat. § 13.82, subd. 5 (1992). Similarly, evidence related to child abuse cases, whether the investigation is active or inactive, is confidential or private data. See Minn. Stat. § 13.82, subds. 5a and 5b (1992). The identity of criminal sexual assault victims is similarly protected. Minn. Stat. § 13.82, subd. 10(b) (1992). To the extent that the BCA is assisting a county coroner or a medical examiner, the release of the data is prohibited. See Minn. Stat. § 13.83 (1992).

Because of the sensitive nature of the criminal evidence examined by the BCA, the legislature has determined that some of the evidence itself and the identity of the suspect or victim should not be released to the public. Thus, it is necessary for the BCA to have a means to confidentially dispose of this evidence. The definitions of private or confidential data do not include release to a disposal company. Thus, prior to disposal, all identifying characteristics would need to be removed from all evidence provided to a disposal company.[1]

Because of the security interests surrounding evidence analyzed by the BCA, it is necessary to allow the BCA to dispose of the evidence on-site. It is reasonable to exempt the BCA from a ban on Class IV incinerators because of the unique character of the materials incinerated by the BCA.

In addition to the privacy concerns associated with the BCA's involvement in criminal cases, the materials incinerated by the BCA are "regulated waste" under 29 C.F.R. pt. 1910.1030(b). Proper disposal of blood and blood soaked materials must be followed.

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1. It appears that the BCA may be able to require a disposal service to maintain the confidentiality of the data through a contract under Minn. Stat. § 13.05, subd. 6 (1992). However, it is unclear whether the contract would protect the BCA should information be released by the disposal service in violation of Minn. Stat. §§ 13.82 or 13.83 (1992).

See, e.g., 29 C.F.R. pt. 1910.1030(d)(4)(iii). Thus, the same concerns raised by hospitals in disposing of infectious waste apply to the BCA.

Based upon these concerns, the BCA believes that it should be exempted from any proposed ban on Class IV incinerators. If I can provide you with additional assistance in this matter, please let me know.

pc: Lowell Van Berkom
Frank C. Dolejsi
Betty Rogers

NJB.wlw.bode.jr5

Appendix 6

Summary of Minnesota Laws Pertaining to Mercury

Minnesota State Laws Pertaining to Mercury

June 1993

Summarized by Edward B. Swain, Minnesota Pollution Control Agency

The following is a simplification and/or extraction of the legal language of each cited law. Direct quotes of the law are indicated by quotation marks, " ". References to other regulated substances have generally been eliminated. Comments are indicated by square brackets, [ ]. Laws that are new in 1993 are indicated by underlining. **Mercury** is not in bold in the actual state laws.

Chapter 16B Department of Administration

Section 16B.24

Subdivision 11. Recycling of Fluorescent Lamps. "When a fluorescent lamp containing mercury is removed from service in a building or premises owned or rented by the state, the commissioner shall ensure that the lamp is recycled if a recycling facility, which has been licensed or permitted by the agency or is operated subject to a compliance agreement with, or other approval by, the commissioner, is available in this state."

[History: 1993 c 249 s 4]

Chapter 115A Waste Management
Prohibitions: Yard Waste, Mercury, & Solid Waste Importation

Section 115A.932 Mercury Prohibition

Subdivision 1. Prohibitions. (a) A person may not place **mercury** or a **mercury**-containing device (thermometer, thermostat, electric switch, appliance, or medical or scientific instrument) in a wastewater disposal system or in solid waste or in **(b)** a solid waste processing facility or a solid waste disposal facility.

[apparently effective 8/1/92].

[History: 1992 c 560 s 1]

(c) "A person may not knowingly place a fluorescent or high intensity discharge lamp:

(1) in solid waste; or

(2) in a solid waste facility, except a household hazardous waste collection or recycling facility.

This paragraph does not apply to waste lamps generated by households until August 1, 1994."

[History: 1993 c 249 s 19]

Problem Materials

Section 115A.9561 Major Appliances
Subdivision 2. Recycling Required. Mercury and other metals contained in major appliances must be recycled or reused.
[History: 1989 law modified to include mercury 1992 c 560 s 2]

Section 115A.961 Household Batteries; Collection, Processing, and Disposal
Subdivision 1. Definition. For the purposes of this section, "household batteries" means disposable or rechargeable dry cells including nickel-cadmium, alkaline, **mercuric** oxide, silver oxide, zinc oxide, lithium, and carbon-zinc batteries, but excluding lead acid batteries.
Subdivision 2. Program. (a) the office may develop household battery programs.
(b) The office shall investigate options and develop guidelines for collection, processing, and disposal of household batteries.
Subdivision 3. Participation. A political subdivision may implement a program to collect, process, or dispose of household batteries. A political subdivision may provide financial incentives to any person, including public or private civic groups, to collect the batteries.
Subdivision 4. Report. By November 1, 1991, the office shall report to the legislative commission on waste management on its activities under this section with recommendations for legislation necessary to address management of household batteries.
[History: 1Sp 1989 c 1 art 20 s 14]

Section 115A.965 Prohibitions on Selected Toxics in Packaging
Subdivision 1. Packaging. No product packaging (including inks, dyes, pigments, adhesives, stabilizers, or any other additives) may contain lead, cadmium, **mercury**, or hexavalent chromium that has been intentionally introduced as an element during manufacture. "Intentional introduction does not include the incidental presence of any of the prohibited elements."
Subdivision 2. Total toxics concentration levels. "The total concentration level of lead, cadmium, **mercury**, and hexavalent chromium added together in any packaging must not exceed the following amounts:"

> 600 parts per million by weight by August 1, 1993;
> 250 parts per million by weight by August 1, 1994; and
> 100 parts per million by weight by August 1, 1995."

Subdivision 3. Exemptions. ....
[History: 1991 c 337 s 50]

Section 115A.9651 Toxics in Products; Enforcement

"After July 1, 1994, no person may deliberately introduce lead, cadmium, **mercury**, or hexavalent chromium into any ink, dye, pigment, paint, or fungicide that is intended for use or for sale in this state."

"Until July 1, 1997, this section does not apply to electrodeposition primer coating, porcelain enamel coatings, medical devices, hexavalent chromium in the form of chromine acid when processed at a temperature of at least 750 degrees Fahrenheit, or ink used for computer identification markings."

[History: 1993 c 249 s 25]

"This section does not apply to art supplies."

"This section may be enforced under sections 115.071 and 116.072. The attorney general or the commissioner of the agency shall coordinate enforcement of this section with the director of the office."

[History: 1991 c 337 s 51].

[Note that the sale of these products is prohibited, not the use.]

Chapter 116 Pollution Control Agency
Incinerators: Monitoring and Compliance

Section 116.85 Monitors Required for Incinerators

Subdivision 1. Emission Monitors. Any incinerator that has an emission limit for **mercury** must conduct periodic stack testing for **mercury** at intervals not to exceed 90 days. Refuse-derived fuel facilities must conduct periodic stack testing for **mercury** at intervals not to exceed 15 months, unless a previous test showed a permit exceedance after which the agency may require quarterly testing until permit requirements are satisfied.

[History: 1989 c 335 art 1 s 133; 1990 c 594 art 1 s 54]

Section 116.90 Refuse-Derived Fuel

Subdivision 2. Use of refuse-derived fuel. Existing or new solid fuel fired boilers may utilize refuse-derived fuel in an amount up to 30 percent by weight of the fuel feed stream under the following conditions....

(1) utilization of refuse derived fuel involves no modification or only minor modification to the solid fuel fired boiler;

(2) utilization of refuse derived fuel does not cause a violation of emissions limitations or ambient air quality standards applicable to the solid fuel fired boiler;

(3) the solid fuel fired boiler has a valid permit to operate;

(4) the refuse-fired fuel is manufactured and sold in compliance with permits issued by the agency and;

(i) is produced by a facility for which a permit was issued by the agency before June 1, 1991; or

(ii) the refuse-derived fuel is produced by a facility where the waste is mechanically and hand sorted to avoid inclusion of items containing **mercury**.

[History: 1991 c 337 s 56; 1992 c 593 s 33]

(5)....

[History: 1991 c 337 s 56]

Mercury Reduction

Section 116.92 Mercury Emissions Reduction

Subdivision 1. Sales. A person may not sell **mercury** in this state without providing a material safety data sheet, and requiring the purchaser to sign a statement that the purchaser :

(1) will use the **mercury** only for a medical, dental, instructional, research, or manufacturing purpose; and

(2) understands the toxicity of **mercury** and will appropriately store and use it and will not place the **mercury** in the solid waste stream or in a wastewater disposal system.

[Subdivision 1 is effective January 1, 1993]

Subdivision 2. Use of Mercury. "A person who uses **mercury** in any application may not place, or deliver the **mercury** to another person who places residues, particles, scrapings, or other materials that contain **mercury** in solid waste or wastewater, except for traces of materials that may inadvertently pass through a filtration system during a dental procedure."

Subdivision 3. Labeling; products containing mercury. The following items that contain **mercury** may not be sold in Minnesota unless the item is labeled in a manner to clearly inform a purchaser or consumer that **mercury** is present in the item and that the item may not be placed in the garbage until the **mercury** is removed and recycled:

(1) a thermostat or thermometer;

(2) an electric switch, individually or as part of another product, other than a motor vehicle;

(3) an appliance; and

(4) a medical or scientific instrument.

[Subdivision 3 applies to items manufactured on and after January 1, 1993)]

Subdivision 4. Removal from service; products containing mercury

(a) When an item listed in subdivision 3 (above) is removed from service the **mercury** in the item must be recycled or otherwise managed to ensure compliance with section 115.932 (above).

(b) A person who is in the business of replacing or repairing an item listed in subdivision 3 in households shall ensure, or deliver the item to a facility that will ensure, that the **mercury** contained in an item that is replaced or repaired is reused or recycled or otherwise managed in compliance with section 115A.932.

[Subdivision 4 paragraph (b) is effective July 1, 1993]

Subdivision 5. Thermostats

A manufacturer of thermostats that contain **mercury** or that may replace thermostats that contain **mercury** shall provide incentives for consumers to ensure that **mercury** in thermostats being removed from service is recycled or otherwise managed in compliance with section 115A.932.

[Subdivision 5 is effective January 1, 1993]

Subdivision 6. Thermometers

"A medical facility may not routinely distribute thermometers containing **mercury**."

Subdivision 7. Fluorescent and High Intensity Discharge Lamps; Large Use Applications.
(a) "A person who sells fluorescent or high intensity discharge lamps that contain **mercury** to the owner or manager of an industrial, commercial, office, or multiunit residential building, or to any person who replaces or removes from service outdoor lamps that contain **mercury**, shall clearly inform the purchaser in writing on the invoice for the lamps, or in separate writing, that the lamps contain **mercury**, a hazardous substance that is regulated by federal or state law and that they may not be placed in solid waste. This paragraph does not apply to a person who incidentally sells fluorescent or high intensity discharge lamps at retail to the specified purchasers."

(b) A person who contracts with the owner or manager of an industrial, commercial, office, or multiunit residential building, or with a person responsible for outdoor lighting, to remove from service fluorescent or high intensity discharge lamps that contain **mercury** shall clearly inform in writing the person for whom the work is being done that the lamps contain **mercury** and what the contractor's arrangements are for the management of the **mercury** in the removed lamps.

Subdivision 8. Ban; toys or games
"A person may not sell for resale or at retail in this state a toy or game that contains **mercury**."

Subdivision 9. Enforcement; generators of household hazardous waste ....
[History: 1992 c 560 s 3; 1993 c 249 s 28]

Section 116.93. Lamp Recycling Facilities.
Subdivision 1. Definition. "For the purposes of this section, 'lamp recycling facility' means a facility operated to remove, recover, and recycle for reuse **mercury** or other hazardous materials from fluorescent or high intensity discharge lamps.
Subdivision 2. Lamp Recycling Facility; Permits or Licenses. (a) A person may not operate a lamp recycling facility without obtaining a permit or license for the facility from the agency. The permit or license must require:
(1) a plan for response to releases, including emergency response;
(2) proof of financial responsibility for closure and any necessary postclosure care at the facility which may include a performance bond or other insurance; and
(3) liability insurance or another financial mechanism that provides proof of financial responsibility for response actions required under chapter 115B.
(b) A lamp recycling facility that is licensed or permitted by a county under section 473.811, subdivision 5b, complies with this subdivision if the license or permit held by the facility contains at least all the terms and conditions required by the agency for a license or permit issued under this subdivision.
(c) A lamp recycling facility with a demonstrated capability for recycling that is in operation prior to adoption of rules for a licensing or permitting process for the facility by the agency may continue to operate in accordance with compliance agreement or other approval by the commissioner until a license or permit is issued by the agency under this subdivision.
[History: 1993 c 249 s 29]

Chapter 144 Department of Health
Health Records and Reports

Section 144.34 Investigation and Control of Occupational Diseases
Any physician having under professional care any person whom the physician believes to be suffering from poisoning from **mercury**, or its compounds, as a result of the nature of the employment of such person shall within five days mail to the department of health a report stating the name, address, and business of the patient's employer, and such other information as may reasonably be required by the department.

Chapter 175 Department of Labor and Industry

Section 175.33 Physicians to Report Certain Cases of Poison to the Department
Every physician attending on or called in to visit a patient whom the physician believes to be suffering from poisoning from **mercury** or its compounds, contracted as a result of the nature of the patient's employment, shall send to the department of labor and industry a notice stating the name and full postal address and place of employment of the patient and the disease from which the patient is suffering, with such other information as may be required by the department.

Chapter 216B

Section 216B.241
Subdivision 5. Conservation Improvement Program; Efficient Lighting. (a) Each public utility, cooperative electric association, and municipal utility that provides electric service to retail customers shall include as part of its conservation improvement activities a program to strongly encourage the use of fluorescent and high intensity discharge lamps. The program must include a least a public information campaign to encourage use of the lamps and proper management of spent lamps by all customer classifications.
(b) A public utility that provides electric service at retail to 200,000 or more customers shall establish, either directly or through contracts with other persons, including lamp manufacturers, distributors, wholsalers, and retailers and local government units, a system to collect for delivery to a reclamation or recycling facility spent fluorescent and high intensity discharge lamps from households and from small businesses as defined in section 645.445 that generate an average of fewer than ten spent lamps per year.
(c) A collection system must include establishing reasonably convenient locations for collecting spent lamps from households and financial incentives sufficient to encourage spent lamp generators to take the lamps to the collection locations. Financial incentives may include coupons for purchase of new fluorescent or high intensity discharge lamps, a cash back system, or any other financial incentive or group of incentives designed to collect the maximum number of spent lamps from households and small businesses that is reasonably feasible.

(d) A public utility that provides electric service at retail to fewer than 200,000 customers, a cooperative electric association, or a municipal utility that provides electric service at retail to customers may establish a collection system under paragraphs (b) and (c) as part of conservation improvement activities required under this section.
(e) The commissioner of the pollution control agency may not, unless clearly required by federal law, require a public utility, cooperative electric association, or municipality that establishes a household fluorescent and high intensity discharge lamp collection system under this section to manage the lamps as hazardous waste as long as the lamps are managed to avoid breakage and are delivered to a recycling or reclamation facility that removes **mercury** and other toxic materials contained in the lamps prior to placement of the lamps in solid waste.
(f) If a public utility, cooperative electric association, or municipal utility contracts with a local government unit to provide a collection system under this subdivision, the contract must provide for payment to the local government unit of all the unit's incremental costs of collecting and managing spent lamps.
(g) All the costs incurred by a public utility, cooperative electric association, or municipal utility for promotion and collection of fluorescent and high intensity discharge lamps under this subdivision are conservation improvement spending under this section.
[History: 1993 c 249 s 31]

Chapter 325E Regulation of Trade Practices
Motor Oil, Batteries, Waste Tires, and Sweeping Compound

Section 325E.125 General and special purpose Battery Requirements
Subdivision 1. Labeling (a) The manufacturer of a button cell battery that is to be sold in this state shall ensure that each battery contains no intentionally introduced **mercury** or is labeled to clearly identify for the final consumer of the battery the type of electrode used in the battery.
Subdivision 2. Mercury Content.
(a) Except as provided in paragraph (c), a manufacturer may not sell, distribute, or offer for sale in this state an alkaline manganese battery that contains more than 0.025 percent **mercury** by weight.
(b) On application, the commissioner of the pollution control agency may exempt a specific type of battery from the requirements of paragraph (a) or (d) if there is no battery meeting the requirements that can be reasonably substituted for the battery for which the exemption is sought. A battery exempted by the commissioner under this paragraph is subject to the requirements of section 115A/9155, subdivision 2.
(c) Notwithstanding paragraph (a), a manufacturer may no sell, distribute, or offer for sale in this state a button cell nonrechargeable battery not subject to paragraph (a) that contains more than 25 milligrams of **mercury.**
(d) A manufacturer may not sell, distribute, or offer for sale in this state a dry cell battery containing a **mercuric** oxide electrode.

(e) After January 1, 1996, a manufacturer my not sell, distribute, or offer for sale in this state an alkaline manganese battery, except an alkaline manganese button cell, that contains **mercury** unless the commissioner of the pollution control agency determines that compliance with this requirement is not technically and commercially feasible.
[History: 1990 c 409 s 2; 1991 c 257 s 3-6; 1992 c 593 s 35; 1993 c 249 s 34]

New 1993 Session Laws

Fluorescent and High Intensity Discharge Lamps; Collection Study
"The director of the office of waste management, in consultation with representatives of public utilities, electric cooperative associations, and municipal utilities that provide electric service to retail customers, the commissioners of the pollution control agency and the department of public service, the Minnesota technical assistance program, the director of the legislative commission on waste management, residential, commercial and industrial electric power consumers, local government units, representatives of manufacturers, wholesalers, distributors, retailers, and recyclers of fluorescent and high intensity discharge lamps, and other interested persons, shall examine and evaluate the potential for collection systems for spent fluorescent and high intensity discharge lamps from households and small businesses. The director shall identify barriers to an effective collection system and approaches to reduce and remove those barriers.

By November 1, 1993, the director shall submit a report to the legislative commission on waste management that, at a minimum, recommends:

(1) collection and management systems for spent lamps that are generated within the service areas of public utilities not governed by Minnesota Statutes, section 216B.241, subdivision 5, paragraph (b), cooperative electric associations, and municipal utilities that provide electric service to retail customers; and

(2) an implementation plan that includes provisions for technical assistance to public utilities, electric cooperative associations, municipal utilities, lamp manufacturers, wholesalers, distributors, and retailers, and local government units that establish fluorescent and high intensity discharge lamp promotion programs and collection systems.

Any person may establish or participate in pilot projects to encourage the use and proper management of spent lamps as part of the study required under this section. All the costs incurred by a public utility, cooperative electric association, or municipal utility related to a pilot project are conservation improvement spending for the purposes of Minnesota Statutes 1992, section 216B.241."
{History: 1993 c 249 s. 53]

Appendix 7

Estimated Cost of the Proposed Rules for Each Waste Combustor Class and All Waste Combustor Classes

APPENDIX 7

ESTIMATED COST OF THE PROPOSED RULE FOR EACH WASTE COMBUSTOR CLASS AND ALL WASTE COMBUSTOR CLASSES

Exhibit 3 is presented as the estimated cost to waste combustor owners and operators to comply with the proposed rule. Exhibit 3 estimates the cost to individual model facilities. This appendix estimates the cost to the industry groups or waste combustor classes as a whole and estimates the cost to all effected facilities in Minnesota.

The cost estimates for each waste class of waste combustor are divided into capital and annual costs. For Tables 1 and 2, for waste combustor Classes A, B, and C, these costs are further divided into the following sectors and annotated as follows:

Equip/Contin = Equipment + contingency + out-of-state energy purchase costs;
Engineering = Engineering costs;
Construction = Construction + demolition costs; and
O&M = Waste disposal + domestic energy purchase (for annual costs, O&M + taxes are included in this sector) costs.

For waste combustor Classes D and IV, these costs are further divided into the following sectors:

Equip/Contin = Equipment + contingency ;
Engineering = Engineering costs;
Construction = Construction + demolition costs; and
O&M = Waste disposal (for annual costs, O&M + taxes are included in this sector) costs.

Tables 1 through 5 show the estimated capital and annual costs, in thousands of dollars, to comply with the proposed rule for each waste combustor class.

Table 1.
Estimated Cost to Class A and B Waste Combustors

	Equip/Contin	Engineering	Construction	O&M
Capital	15,327	3,593	2,323	6,474
Annual	2,015	472	306	4,535

This estimate is based on all Class A and B waste Combustors upgrading to comply with the proposed rule.

Table 2.
Estimated Cost to Class C Waste Combustors

	Equip/Contin	Engineering	Construction	O&M
Capital	7,053	931	4,071	2,542
Annual	927	72	535	759

This estimate is based on all of the Class C waste combustors upgrading to comply with the proposed rule.

Table 3.
Estimated Cost to Class D Waste Combustors

	Equip/Contin	Engineering	Construction	O&M
Capital	6,480	1,750	4,630	
Annual	1,120	290	770	1,190

This estimate is based on six of the estimated twenty Class D waste combustors ceasing operation.

Table 4.
Estimated Cost to Class IV Waste Combustors

	Equip/Contin	Engineering	Construction	O&M
Capital	10,160	1,040	11,350	
Annual	1,660	160	1,870	-4,610

This estimate is based on 1,200 Class IV waste combustors ceasing operation as a result of the proposed ban on Class IV waste combustors that are not used for the on-site incineration of medical or pathological waste or metal recovery.

The estimated negative O&M annual cost is an estimated savings to Class IV waste combustor owners as a result of ceasing operation of an existing waste combustor in favor of recycling and/or using the MSW system.

Table 5.
Estimated Cost to Medical Waste Combustors

	Equip/Contin	Engineering	Construction	O&M
Capital	5,029	910	1,310	31
Annual	825	149	214	678

This estimate is based on most small hospitals (21 of 36) with 124 beds or fewer ceasing operation of an existing medical waste combustor in favor of commercial disposal and all nine large hospitals upgrading to comply with the proposed rule. This estimate also includes the estimate cost to add activated carbon injection to the one existing commercial medical waste combustor in Minnesota.

The estimated capital and annual costs, in thousands of dollars, to comply with the proposed rule for all classes of waste combustors is as follows:

Table 6.
Estimated Cost to All Classes of Waste Combustors

	A & B	C	D	IV	Hosp	Total
Capital	27,717	14,597	13,220	22,550	7,280	85,364
Annual	7,328	2,293	3,370	-920	1,866	13,937

Minnesota Pollution Control Agency

October 1, 1993

Ms. Maryanne Hruby
Executive Director
Legislative Commission to Review
Administrative Rules
State Office Building, Room 55
100 Constitution Avenue
St. Paul, Minnesota 55155

Dear Ms. Hruby:

Subject: Statement of Need and Reasonableness for Proposed Amendments to Permanent Rules Governing Air Quality Standards of Performance for Waste Combustors and Permitting Requirements (Minn. Rules pts. 7007.0200, 7007.0250, 7007.0501, 7007.0801, 7011.0551, 7011.0625, 7011.1201 to 7011.1285 and 7010.1000)

Enclosed for your review is a copy of the Statement of Need and Reasonableness for proposed rules as required by Minn. Stat. § 14.115, subd. 8 (1992). If you have any questions, please call me at 296-7712.

Sincerely,

Norma L. Florell

Norma L. Florell
Planning and Rule Coordinator
Program Development Section
Air Quality Division

NLF:jmd

Enclosure