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Minnesota Pollution Control Agency

June 29, 1995

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:

RE: Statement of Need and Reasonableness for Proposed Rules Governing Removal of Lead Paint from Steel Structures, Minn. R. 7025.0200 to 7025.0380.

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 (1994). If you have any questions, please call me at 296-7712.

Sincerely,

Norma L. Coleman 6-7712
Norma L. Coleman
Rule Coordinator
Program Development Section
Air Quality Division

NLC:jmd

Enclosure

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STATE OF MINNESOTA
POLLUTION CONTROL AGENCY

In the Matter of the Proposed Rules Governing Removal of Lead Paint from Steel Structures. Minn. Rules pts. 7025.0200 to 7025.0380

STATEMENT OF NEED AND REASONABLENESS

I. INTRODUCTION

These proposed rules require the use of pollution control to protect public health and to prevent contamination of property and the environment with lead paint particles during lead paint removal from steel structures throughout Minnesota. Provisions apply to testing for lead in paint, notification, the use of containment, alternative methods of paint removal, and cleanup of waste deposits. Significant contamination is caused by removal of exterior lead paint from steel structures as it has been conducted in Minnesota. There are about 1,000 steel water tanks in the state, nearly 8,000 steel bridges, and more than 10,600 chemical and fuel storage tanks. Most of these have lead paint on them. Minnesota Pollution Control Agency (MPCA) staff estimate that 130,000 to 180,000 pounds of lead are removed each year from steel structures in the state. Most of these coatings are removed by abrasive blasting which can release large amounts of particulate matter. By comparison, the total air emissions of lead in 1992 for all industrial point sources in the state were calculated at 155,520 pounds. Lead paint removal from steel structures has not been effectively regulated.

Abrasive blasting has been used for paint removal and surface preparation in the maintenance of steel structures both in Minnesota and across the United States since the 1940's. Sandblasting, using sand as the abrasive, has been the conventional method used by owners of steel structures and contractors in Minnesota for removing corrosion and existing coatings and for preparing the steel surface for application of new coatings. Abrasive blasting is very efficient in rate of production. When it is done without pollution controls, it is a relatively economical method of conducting paint removal and surface preparation. The process abrades the coatings and produces small particles of paint. Large amounts of particulate are also generated by the use of abrasives which fracture upon impact with the steel. Dry abrasive blasting of steel surfaces with silica sand is especially dusty.

The MPCA initiated a review of lead paint removal from steel structures in 1986 in response to the report of the Governor's Task Force on Lead of December 19, 1984 (exhibit (exh.) 1). That report included two recommendations with regard to sandblasting:

1) Minn. Rules pt. 7005.0550 (now 7011.0150), Preventing Particulate Matter from Becoming Airborne, be revised to control sandblasting of houses and buildings with lead paint; and

2) Minnesota Department of Transportation (MnDOT) study the use of wet sandblasting in the place of dry sandblasting to reduce lead emissions in the maintenance of bridges.

A review of the literature and contact with other agencies provided only some information on the effect of abrasive blasting of steel structures on contamination of the environment or on the public health. Little information was obtained on the quantities of lead on different structures. Communication with the environmental and highway departments of other states yielded a few copies of the guidelines for abrasive blasting of bridges that existed at the time. A review of abrasive blasting regulations of different cities, counties, regions, and states was conducted in 1986 and was subsequently published in 1988 (reference (rf.) 3).

MPCA staff met with MnDOT in early 1986 and obtained a list of all steel bridges on state and federal highways in the state as well as information on the constituents of bridge coatings that contain lead. In addition, MnDOT has provided each year upon request a list of bridges where maintenance repainting has involved the removal of coatings that contain lead. Contract specification language regarding pollution control for these bridges has also been provided each year upon request.

There was very little data of lead concentrations in any media as a consequence of dry abrasive blasting of lead paint on bridges. A field study was undertaken by MPCA staff in 1987 that measured the increment of lead added to the soil by conventional abrasive blasting of steel bridges with lead-based coatings. The findings of this study were reported as "Lead Contamination of Soil by Sandblasting of Bridges" in a presentation given in February 1988 at the first annual "Lead Paint Removal from Steel Structures" symposium of the Steel Structures Painting Council (SSPC) (exh. 2). Increased lead was measured in soil at all distances from the bridges following paint removal. The greatest increase in lead concentration exceeded 8,000 parts per million (ppm). This represents more than 8,600 percent of the lead in soil before paint removal (see III.B.2.c below).

As a consequence of this study and subsequent discussions and correspondence with MnDOT, preliminary guidelines were proposed in April 1989 that included the use of ground cover and curtains on all steel bridges that bear lead paint (exh. 3). On-going negligence of contractors to existing regulations that affect open dry abrasive blasting and to pollution control specifications in contracts led to persistent violations and enforcement problems. Furthermore, contract language was deficient in prescribing minimum pollution control requirements that would address existing air quality and hazardous waste regulations and the general problem of lead contamination (see III.A.1.f. below). At a meeting in June 1989 between MPCA Air Quality Division and MnDOT Office of Bridges and Structures, agreement was reached to develop a Memorandum of Agreement between the two agencies that would address this activity. This document was drafted by MPCA staff and referred to MnDOT for consideration (exh. 4). In its response, MnDOT advocated formal regulation of lead paint removal from all bridges, because this would regulate all parties to such activity and not only the state (exh. 5).

Initial MPCA activity with abrasive blasting of steel structures was directed at bridges. Early investigation of water towers where exterior paint removal was conducted with abrasive blasting did not reveal significant amounts of lead in paint. However, in the summer of 1989 there were three elevated water tanks in the metropolitan area whose exterior coatings contained significant concentrations of lead in paint that were removed by dry abrasive blasting without pollution control (see also III.B.2.a. below). These events precipitated extensive involvement of MCPA staff in these situations and served to enlarge the attention of MPCA staff to the presence of lead paint on steel structures other than bridges.

Recommendations for pollution control of abrasive blasting of lead-painted bridges and water tanks were prepared by MPCA staff and distributed to each of the 854 municipalities in the state in March 1990 with a cover letter identifying the problem of public heath risk and environmental contamination from lead paint particles generated by removal of coatings without pollution control (exh. 6). The League of Minnesota Cities was first provided a copy of this information and approved this effort (exh. 7). These recommendations prescribe testing for lead and the use of containment with curtains and ground cover and recommend alternative methods of removal where high concentrations of lead are found in proximity to susceptible properties. The cities were asked to carefully apply these provisions whenever paint containing lead was removed from these structures in order to protect public health and to prevent environmental contamination. In May 1990, following communication with the Association of Minnesota Counties, the recommendations for lead paint removal from bridges were distributed to each county engineer in the state (exh. 8). This information was also published in the April 24, 1990, issue of the monthly Minnesota Counties (exh. 9). Subsequent to discussion with the Minnesota Association of Townships, the provisions of the guidelines were published in the March/April 1990 issue of the newspaper Minnesota Township News (exh. 10). This was done to inform the 1,803 townships in Minnesota of the problem of lead paint removal from township bridges. These guidelines have since been provided to hundreds of contractors, consultants, owners, and public officials throughout Minnesota and around the country.

In a further effort to apprise owners, consultants, and contractors of the significant quantities of lead in paint and the importance of careful lead paint removal, a number of presentations have been made by MPCA staff to different audiences. This has included a presentation at the annual meeting of the League of Minnesota Cities in Duluth in June 1990, the Northwest Minnesota Waterworks Operators School in Crookston in November 1990, the Engineers Club of St. Paul in September 1991, participation in the regional tutorial of the SSPC, "Removing Lead Paint from Industrial Structures," in Minneapolis in March 1992, and the Collection System Operators Seminar in Bloomington in January 1993.

A "Notice of Intent to Solicit Outside Information Regarding Proposed New Rules Regarding the Removal of Lead Paint from Residences, Bridges, and Water Towers" was published in the State Register on May 14, 1990 (exh. 11). One response was received from MnDOT (exh. 12). The MPCA promulgated Minn. Rules pts. 7025.0010 to 7025.0080 (1993), Abrasive Blasting of Lead Paint on Residential, Child Care, and School Buildings, to address risk to the public health and contamination of the environment from this activity. This rulemaking was completed in 1991 and the rule took effect on September 2, 1991 (exh. 13).

A "Notice of Intent to Solicit Outside Information Regarding Proposed New Rules Regarding the Removal of Lead Paint from Steel Structures" was published again in the State

Register on March 2, 1992 (exh. 14). One telephone response was received from a water tank consultant.

Referral lists that provide the name, address, and telephone number of manufacturers of paint removal equipment and containment equipment have been compiled in an on-going effort to apprise owners, contractors, and consultants of alternative methods of paint removal. This information has been offered to industry representatives since October 1991 when a list of vacuum abrasive blasting equipment manufacturers was prepared. This was followed in February 1992 by a more complete list that included vacuum abrasive blasting, abrasive recovery and dust collection, containment screens, steel recyclable abrasives, chemical stripping, abrasive additives, power tools, vacuum recovery, and wet abrasive blasting. This list was revised in May 1992 (exh. 15). The purpose of this information was to assist the industry, that by tradition has used open dry abrasive blasting, to avail themselves of alternative removal equipment and containment materials. In conjunction with the recommendations, this was intended to encourage self-regulation by those responsible for maintenance of steel structures. The use of these materials would prevent and reduce contamination due to lead paint removal. MPCA staff continue to provide this information on an individual basis.

An early draft of this regulation (dated 05/25/90) directed at bridges and water towers was mailed to nine parties in the United States and Canada on June 11, 1990, for technical review. Both oral and written comments were received. On June 19, 1992, a later draft of this rule (dated 06/09/92) was mailed to 10 public and private individuals in the United States and Canada for technical review. These represented consultants, contractors, owners, and a steel structure industry organization (exh. 16). Again, both oral and written comments were received.

Most recently, a "Notice of Intent to Form Advisory Committee to Assist in the Review of New Rules Regarding the Removal of Lead Paint from Steel Structures" was published in the State Register on December 21, 1992 (exh. 17). A copy of this notice was mailed to 116 associations, facility and structure owners, contractors, consultants, and environmental groups. Copies of the draft rule were mailed to parties who requested them. A letter inviting interested parties to meetings on February 3 and 4, 1993, to discuss the language of the draft rule was sent on January 21, 1993 (exh. 18). Twenty-one people attended these meetings where comments were tape-recorded and later reviewed and transcribed.

II. STATEMENT OF AGENCY'S STATUTORY AUTHORITY

The MPCA's statutory authority to adopt the rules is set forth in Minn. Stat. § 116.07, subd. 4 (1994) which provides, with respect to 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 provisions of Laws 1967, chapter 882, 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 allowances for variations therein. Without limitation, rules or standards may relate to sources or emissions of air contamination or air pollution, to 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.

In addition, section 116.07, subdivision 4 (1994) provides, with respect to solid waste:

> 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 provisions of Laws 1969, chapter 1046, 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, and the deposit in or on land of any other material that may tend to cause 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 allowances for variations therein. 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 control of collection, transportation, processing, and disposal of solid waste and sewage sludge, and the deposit in or on land of any other material that may tend to cause pollution.

In addition, section 116.07, subdivision 4 (1994) provides, with respect to hazardous waste:

> Pursuant to chapter 14, the pollution control agency may adopt, amend, and rescind rules and standards having the force of law relating

> to any purpose within the provisions of this chapter for generators of hazardous waste, the management, identification, labeling, classification, storage, collection, treatment, transportation, processing, and disposal of hazardous waste and the location of hazardous waste facilities. A rule or standard may be of general application throughout the state or may be limited as to time, places, circumstances, or conditions.

In addition, section 115.03, subdivision 1 (e) (1994) provides, the MPCA with the following powers and duties with respect to water pollution:

> To adopt, issue,...enforce reasonable orders,...standards, rules, ...under such conditions as it may prescribe, in order to prevent, control or abate water pollution...;
> (1) Requiring the discontinuance of the discharge of ...industrial waste or other wastes into any waters of the state resulting in pollution in excess of the applicable pollution standard established under this chapter;
> (2) Prohibiting or directing the abatement of any discharge of ...industrial waste, or other wastes, into any waters of the state ...
> (3) Prohibiting the storage of any liquid or solid substance or other pollutant in a manner which does not reasonably assure proper retention against entry into any waters of the state that would be likely to pollute any waters of the state;
> (4) Requiring the construction, installation, maintenance, and operation by any person of ...other equipment...or the adoption of other remedial measures to prevent, control, or abate any discharge or deposit of ...industrial waste or other wastes by any person.

Under these statutes the MPCA has the necessary statutory authority to adopt the proposed rules.

III. STATEMENT OF NEED

Minn. Stat. §§ 14.14, subd. 2 and 14.23 (1994) require the MPCA to make an affirmative presentation of facts establishing the need for and the reasonableness of the proposed rules. In general terms, this means that the MPCA must set forth the reasons for proposing rules and the reasons must not be arbitrary or capricious. However, to the extent that need and reasonableness are separate, need has come to mean that a problem exists which requires administrative attention, and reasonableness means that the solution proposed by the MPCA is a proper one. The need for the rules is discussed below.

A. Need for Compliance with Current Regulations

1. **State rules and statutes**

a. **Air emissions regulations**

Minn. Rules pt. 7011.0150 (1993), Preventing Particulate Matter from Becoming Airborne, requires that a person handle, use, transport, or store a material in a manner that prevents "avoidable amounts" of particulate matter from becoming airborne. Further, it provides that a person shall apply "all such reasonable measures as may be required to prevent particulate matter from becoming airborne" for a number of construction-related activities. This regulation, often referred to as the "fugitive dust" rule, would be violated any time abrasive blasting is conducted against any substrate or surface without containment or without the use of a low-dust abrasive or of water or other means to restrict the generation and dispersal of dust. This rule has been cited in enforcement action directed at abrasive blasting of lead paint on steel structures in Minnesota.

Minn. Rules pt. 7011.0110 (1993), Visible Emission Restrictions for New Facilities, prohibits visible emissions of greater than 20 percent opacity from emission facilities. "Emission facility" is defined as "..any structure, work, equipment, machinery, device, apparatus, or other means whereby an emission is caused to occur." Minn. Rules pt. 7011.0110, subp. 10 (1993). Dry abrasive blasting of steel surfaces that is open, i.e., done without containment, using silica sand is known to cause emissions to the ambient air that violate this standard. This rule has been cited in enforcement action directed at abrasive blasting of lead paint on steel structures in Minnesota.

These existing rules do not regulate abrasive blasting by name, nor do they mention lead paint. Nevertheless, they have been cited in both Notices of Violation and Letters of Violation to regulate abrasive blasting of lead paint from exterior steel of both bridges and water tanks. In addition, every year many copies of these rules have been provided to contractors, consultants, and owners of steel structures as a way to promote the use of containment in abrasive blasting to prevent lead contamination.

Minn. Rules pt. 7009.0020 (1993), Prohibited Emissions, prohibits a person from emitting any pollutant so as "...to cause or contribute to a violation of any ambient air quality standard beyond such person's property line..." The standards that would pertain to conventional lead paint removal would be state and federal standards for lead (Pb), particulate matter smaller than 10 microns (PM10), and total suspended particulate (TSP) matter. Violations of this rule would be determined by air monitoring at the property line. Such monitoring has been conducted in other states during abrasive blasting to remove lead paint from bridges and water tanks. For a discussion of these standards and measurements of concentrations of both lead in air and particulates in air during abrasive blasting of lead paint from steel structures, see the treatment of federal regulations (in III.A.2.a. below). On September 13, 1994, Minnesota adopted the federal Pb and PM10 standards.

Minn. Rules pt. 7007.0250 (1993), Sources Required to Obtain a State Permit, subpart 4, requires that a stationary source with potential lead emissions of at least 1,000 pounds per year obtain an air emission permit. The larger bridges in the state with lead paint have many times 1,000 pounds of lead on the steel surfaces which is emitted as an air pollutant when the structure is dry abrasive blasted without containment (see also III.B.1. and B.2. below). This activity has never been regulated by air quality permits in Minnesota, and a permit requirement for stationary sources has not been enforced. The proposed rules require notification in the place of obtaining a permit before removing lead paint from steel structures.

There is a particulate matter standard in Minnesota, Minn. Rules pt. 7009.0080 (1993), State Ambient Air Quality Standards. This is often referred to as the TSP standard, to distinguish it from the PM10 standard. The primary standard, to protect human health, is 260 micrograms per meters cubed (ug/m^3) and the secondary standard, to protect human welfare, is 150 ug/m^3 as a 24 hour average with one actual exceedance per year. The annual TSP standards are 75 ug/m^3 and 60 ug/m^3 respectively, measured as a geometric mean. These standards are the same as the federal primary and secondary TSP standards. Like the fugitive dust rule and the visible emissions rule, they are directly affected by paint removal by abrasive blasting (see also III.A.2.a. below).

Minn. Stat. § 116.061 (1994) requires a person who controls the source of an emission to take immediate and reasonable steps to minimize the emissions or abate the air pollution caused by the emissions. This rule alone would prevent the practice of dry abrasive blasting without pollution control, whether or not lead paint was being removed from steel surfaces.

Measurements of the emissions during abrasive blasting of lead paint on steel surfaces have been examined in several published and unpublished studies. One of these that included extensive air monitoring is treated here. Other studies are discussed further in this text. Many of these documented exceedances of the standards for regulated emissions that are cited above. A study of different air emissions generated during the repainting of the Bourne Bridge in Massachusetts was conducted from 1979 to 1981 (rf. 4). This suspension bridge bore lead paint although the concentration is not reported. No containment was implemented during paint removal with a silica sand abrasive. At the time the federal air quality particulate standard was measured in TSP. There was no exceedance of the annual TSP standards or the primary 24-hour standard at any of the five monitoring sites. The secondary 24-hour standard was exceeded on seven days of sandblasting, although, because this standard allows one exceedance per year per monitor, actual violations occurred at only one sample site. The highest 24-hour TSP value was 232 ug/m^3 and the highest annual geometric mean (12 month average) was 33 ug/m^3.

The Bourne Bridge study presents evidence of the significant effect of vehicular traffic on the reentrainment of total particulates as well as lead particles by a comparison of days with sandblasting and days without sandblasting by season and by average daily traffic volume. Both sandblasting and traffic volume were associated with higher concentrations of airborne lead and TSP. 150 ug/m^3 of TSP were measured on a day without sandblasting, a number equal to the secondary 24-hr standard. It should be stated too that some of the lead measured in the air samples collected near the bridge was undoubtedly due to combustion of leaded gasoline. In 1980 regular grade gasoline contained about 1.3 g of lead per gallon (gal). The measurements of lead in air samples are discussed in III.A.2.a.

The Bourne Bridge study (rf. 4) included measurements of "source strength" in order to determine the particle size, the lead content, and the rate of generation of particulates during sandblasting. Two different emissions tests were conducted to measure the quantity of material generated by a single worker sandblasting painted steel. The first test comprised three different sampling periods over two days with two high-volume samplers, one of which differentiated two size fractions. The second test also sampled for two days with two Inhalable Particulate Cyclone Samplers which separated the particles into three size fractions. With additional sieving in the laboratory, six different size categories were derived. The amount of total particulate generated by the sandblaster in the first experiment was calculated at 133 pounds per hour (lb/hr) and 345 lb/hr in the second experiment. The amounts of lead generated by the sandblaster were 2.7 lb/hr and 4.2 lb/hr, respectively.

Approximately 10 pounds of silica sand abrasive are necessary to sandblast one square foot (ft^2) of coated steel surface area to white or near-white metal (SSPC-SP 5 or SP 10). This average figure varies according to the thickness and adherence of the coatings, the configuration of the steel surface, the blast pressure, and other factors. Other rates of consumption are cited in the literature, both higher and lower. Less abrasive is used for other standards of surface preparation, such as brush-off blast cleaning (SSPC-SP 7) and commercial blast cleaning (SSPC-SP 6).

The California Air Resources Board (CARB) certifies abrasives for use in dry outdoor blasting. Candidate abrasives are tested by blasting steel plate under prescribed conditions. Before testing, the abrasive must either pass a sieve test for size or exhibit less than 20 percent opacity of emissions in a dry abrasive blasting test. Certified abrasives cannot contain more than 1.8 percent by weight of particulates smaller than 5 microns after blasting. In general, silica sand abrasives are more easily fractured and therefore more dusty when used against steel surfaces than the synthetic metal abrasives and the non-silica mineral abrasives. Silica sands on the CARB list are the less friable silica products that do not fracture so readily upon impact. Because they are the least expensive, silica sand abrasives have been the most widely used in Minnesota by abrasive blasting contractors.

b. Soil lead standards

A standard for lead in bare residential and playground soils of 300 ppm, Lead Abatement in Soil, took effect on January 26, 1991. Minn. Rules pts. 4760.0010 to 4760.0050 (1993). However, in the 1993 legislative session, Minn. Stat. § 144.878, subd. 2, was amended to establish a 100 ppm standard for lead in bare residential and playground soils. This law took effect on August 1, 1993.

As reported in the MPCA study of the effects of sandblasting lead-painted bridges (exh. 2), conventional abrasive blasting, without use of ground cover, caused increases in lead concentration of soil of thousands of ppm to distances over 80 feet (ft) from the steel girders of the largest bridge. For bridges sited in residential or public use areas that included unvegetated areas, the soil lead standard would readily be exceeded as a result of lead paint removal without effective pollution control. Among steel structures, municipal water tanks with exterior lead paint, and water towers in particular, probably have the greatest potential to contaminate residential property and playground areas, both because of their siting in residential areas and their height. Where unregulated abrasive blasting of these structures occurs, without the use of screens or curtains and with inadequate or careless use of ground cover, the soil lead standard would readily be violated, particularly for foundation soils and areas where children concentrate at play, as near play equipment or in sand boxes. These sites are frequently unvegetated.

The amount of lead added to soil by removal of lead paint from steel structures is a function of the concentration of lead in the coatings that are removed and the amount of paint that is removed. This in turn is a function of the surface area and the thickness of the paint. Where abrasive blasting is used, the quantity of abrasive used per unit of painted surface area is also a factor in the concentration of lead added to the environment. A sample taken of abrasive waste on the soil surface at one water tower in Minnesota was 1,250 ppm lead next to a residence, and on a parking lot over 300 ft from the tower there was 3,750 ppm lead in sandblasting waste. This water tower had 10 percent total lead in the paint that was removed. The provisions for containment and cleanup in the proposed rule should prevent such increases in lead concentrations in soil (see also III.B.2.a. below).

In addition to air sampling, the study of the Bourne Bridge in Massachusetts (rf. 4) measured particle fallout as an effect of sandblasting lead paint, to determine different concentrations of lead and total particulates. As stated above, the concentration of total lead in the paint on this bridge is not reported. Paint removal was done from 1979 to 1991 with a silica sand abrasive and without containment. Eighteen dustfall samplers were arrayed on both banks of the canal to measure rates of deposition of lead and particulates. The nearest buckets were underneath the bridge and the furthest were at 450 meters distance. As expected, the greatest rate of deposition occurred directly beneath the bridge. The greatest rate of fallout of total particulate for one month was 10,159 $g/m^2/mo$.

The greatest fallout rate for lead for one month was 8.0 $g/m^2/mo$. The geometric mean lead concentration of all deposition samples was 0.229 percent (2,290 ppm). By comparison, the mean lead content of the particulate collected by the high-volumes was 0.37

percent (3,700 ppm). The maximum lead content of the fallout samples was 6.639 percent (66,390 ppm). These samples contain only "settleable" particles, those particles that deposit within a finite distance because of their size and density.

c. **Lead in housedust standards**

The Minnesota Department of Health (MDH) promulgated rules governing residential lead abatement methods and standards for lead in paint, dust, and drinking water which took effect April 1, 1991, Residential Lead Abatement, Minn. Rules 4761.0100 to 4761.0800 (1993). Included in this regulation are standards for lead in housedust on different interior surfaces of residential property. The standards are 80 ug/ft^2 for hard-surfaced floor, 300 ug/ft^2 for windowsill, 500 ug/ft^2 for window well, and 300 ppm for carpeting. These standards would apply wherever lead paint removal from steel structures caused contamination of house dust such as might happen when a water tower is repainted in a residential area.

The federal Housing and Urban Development (HUD) agency issued a document "Lead- Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing" in September 1990 that includes the standards for lead in housedust for Maryland and Massachusetts. These standards are 200 ug/ft^2 for floors, 500 ug/ft^2 for window sills, and 800 ug/ft^2 for window wells. Although there are no formal federal standards, the report recommends that these levels be used as "clearance criteria" for reoccupation following abatement. In addition, the guidelines state that the standard for floors should be applied also to porches. These concentrations are higher than the Minnesota standards. HUD has not completed final standards for housedust.

Abrasive blasting of lead paint on steel structures in proximity to residential property can cause serious contamination of the household interior if containment or pollution control is not used. For example, a water tank that was sandblasted in Texas without containment resulted in 11,000 ppm lead in abrasive dust deposited on a table in a screened-in porch (rf. 28). The house was approximately 200 ft from the base of the tank. In Rhode Island, an elevated bridge that was sandblasted (with vertical curtains) caused 6,500 ppm lead in dust on a kitchen window sill in a home about 500 ft distant. At this same residence, a dust sample taken from a child's slide on the outdoor deck contained 12,000 ppm lead by weight and the rail of the deck was contaminated with 7,900 ppm lead (personal communication T. Burns, RIDEM) (see also III.B.2 below). Minimum pollution control is required by provisions of the proposed rules for removal of paint that contains more than 0.5 percent total lead from steel structures. Notification provisions in the proposed rules require that children's toys and play equipment be covered or removed from the outside and that doors and windows on the walls that face the structure and adjoining walls be closed.

Closing windows and doors of houses in the area of abrasive blasting of lead paint would prevent direct contamination of household interiors, but unless effective containment is used to prevent dispersal of paint particles, significant transfer of contaminated dust from the exterior property to the inside will occur both by air movement and foot traffic. Several studies have established that the transfer of lead particles from outside to inside a residence occurs by a pathway of exterior soil to exterior dust to interior housedust. Contaminated housedust then causes lead absorption by ingestion and increased blood lead. Lead in housedust is especially hazardous because it is absorbed by residents, especially children between the ages of six months and six years. and causes lead poisoning with very serious consequences (see III.B.3. below).

d. Hazardous waste regulations

There are a number of state and federal regulations that restrict the generation and disposal of wastes that are classified as hazardous. This could include much of the waste produced by removal of coatings that contain lead. Non-abrasive methods of paint removal such as power tools and hand tools will generate wastes that consist primarily of the coatings themselves. Abrasive blasting with recyclable abrasive will similarly produce wastes with a large content of paint particles when particle classification and dust collection are used effectively. The waste produced by conventional abrasive blasting, with non-recyclable abrasive, will be a much larger volume that will contain a smaller concentration of lead. Concentrations of total lead in the paint before removal are typically 20 to 30 times the concentrations of total lead in the sandblasting waste. Chemical stripping with corrosive pastes also generates a waste that comprises more than the paint alone. This volume is much smaller than that produced by blasting with an abrasive that is not recycled. All wastes are evaluated by the U.S. Environmental Protection Agency (EPA) Toxicity Characteristic Leaching Procedure (TCLP) test to determine if they constitute hazardous waste. For a discussion of the hazardous waste standard for lead and test results of lead concentrations in lead paint waste generated from steel structures, see III.A.2.c below.

Minn. Rules pt. 7045.0020 (1993), Definitions, states that "'Disposal' means the discharge, deposit, ...dumping, spilling...of waste into or on any land or water so that the waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters..."

Minn. Rules pt. 7045.0214 (1993), Evaluation of Wastes, subpart 1, General requirement, requires, "Any person who produces a waste within the state of Minnesota ...must evaluate the waste to determine if it is hazardous."

Minn. Rules pt. 7045.0275 (1993), Management of Hazardous Waste Spills, subpart 2 . Spills; duty to report, and subpart 3, Spills; duty to recover, state that a person who controls or generates a hazardous waste that "..spills, leaks, or otherwise escapes from a ..containment system.." shall notify the agency "..if the hazardous waste may cause pollution of the air, land resources, or waters of the state" and recover the waste "..and minimize or abate pollution of the water, air, or land resources of the state."

Minn. Rules pt. 7045.0208 (1993), Hazardous Waste Management, requires that a generator treat or dispose of its hazardous waste in an on-site facility or ensure delivery to either an off-site treatment, storage, or disposal facility or to a facility that uses or reuses, recycles or reclaims the waste according to requirements of chapter 7045.

As with the other state regulations enumerated above, compliance with these hazardous waste regulations in Minnesota has been the exceptional, rather than the common, practice where lead paint has been removed from steel structures. Indeed until the last few years, there was neither any effort to identify lead in paint nor any effort to contain the dispersal of lead paint particles during paint removal. The testing and disposal of lead paint wastes according to state hazardous waste rules was not a practice of either owners or contractors. With no pollution control during abrasive blasting, there was little or no collection or recovery of waste material. These wastes were not contained, but were instead dispersed over a large area in directions downwind of the steel structure. Where large structures with high concentrations of lead in paint are sandblasted, very large quantities of waste are generated that result in very large areas of contamination (see III.B.2). In these cases, the site of final disposition of this waste is the same as the area of dispersal and deposition. Without the effective use of pollution control, these waste materials have been "dumped". This is improper disposal, whether with appropriate testing for lead content, the material would be classified as a hazardous waste or a solid waste.

The proposed rules require the use of pollution control methods when lead paint is removed from steel structures. Lead paint in the proposed rules is defined as a coating that contains more than 0.5 percent total lead. Compliance with these provisions will at the same time address the need to properly contain and dispose of wastes that may be hazardous. It would be unlikely for a coating that contained less than 0.5 percent lead that was removed by abrasive blasting with an expendable abrasive to be a hazardous waste according to the TCLP test. At this concentration hazardous waste may be produced by mechanical removal without a chemical or abrasive medium, or by abrasive blasting with an abrasive that is cleaned and recycled. Wastes generated by these processes; however, are confined as they are produced or they are less readily dispersed and more easily contained. According to Minn. Rules pt. 7045.0214 (1993), cited above, a generator must evaluate a waste to determine if it is hazardous. Removal of lead paint from those steel structures with more than 0.5 percent lead is the primary environmental and public health concern. Such structures comprise the large majority of steel structures that have lead in paint. The requirements for pollution control in the proposed rules will also address compliance with existing hazardous waste regulations.

e. Water quality regulations

Minn. Stat. § 115.061 (1994) requires a person to notify the MPCA of any discharge that may cause water pollution and to recover the material and abate the pollution.

Minn. Rules pt. 7050.0185 (1993), Nondegradation for All Waters, establishes a nondegradation policy for all waters of the state.

Minn. Rules pt. 7050.0210 (1993), General Standards for Dischargers to Waters of the State, subpart 2 prohibits any discharge to waters of the state so as to cause nuisance conditions which include "significant amounts of floating solids,...excessive suspended solids,...aquatic habitat degradation,...or other offensive or harmful effects." Subpart 13 prohibits any discharge into waters of the state so as to cause pollution as defined by law.

Minn. Rules pt. 7050.0220 (1993), Specific Standards of Quality and Purity for Designated Classes of Waters of the State, subpart 2 establishes a standard for lead for waters that are used for domestic consumption. Subpart 3 establishes a standard for lead for waters used as fisheries. These standards are dependent on the hardness of the receiving water.

These regulations for protection of water bodies of the state and the standards for lead in water are most affected by the removal of lead paint from bridges that traverse waterways. The concentration of lead in surface water as an effect of uncontained paint removal is a function of the concentration and volume of paint on the structure, the rate of paint removal, the number of workdays of the project, and the volume and rate of flow of the waterway. These water quality rules and standards can be readily violated where lead paint removal from bridges is not restricted. In one instance, calculations using these variables indicate that lead concentrations in the river beneath a sandblasted bridge would be 10 to 20 times the lead standard for that water body if all the paint particles deposited on the water surface (see III.B.2.c below). Only in recent years has there been any effort to provide any protection of water bodies where lead paint is removed from these structures. Language in the proposed rules provides specific protection for water bodies where lead paint is removed from a bridge.

f. MnDOT Standard Specifications

MnDOT Standard Specifications for Construction (ed. 1988) 1717, Air, Land, and Water Pollution, requires that pollution of air, land, and water in the conduct of a contract be "..prevented, controlled, and abated in accordance with the rules, regulations and standards adopted and established by the MPCA, the Minnesota Department of Natural Resources (MnDNR), and the Corps of Engineers." Further, the contractor shall prevent pollution of surface water "...with any particulate...matter that may be harmful to fish and wild life or detrimental to public use of the water." The first part of this specification was added to the 1983 edition of the specification book. The 1983 specification, which was titled "Air and Water Pollution," stated, "All applicable regulations of pollution control and fish or wildlife agencies relating to prevention and abatement of pollution shall be complied with in the performance of the contract work." The paragraph regarding protection of water is essentially the same text in the 1983 specification as in the 1988 edition.

In some specific bridge painting contracts, "special provisions" which supplement MnDOT specification 1717, Air, Land, and Water Pollution, state that the contractor must contain waste materials on the site and must avoid indiscriminate deposition of paint particles "into the water, onto the ground, or roadway below." (see also III.A.3. below)

2. Federal standards and guidelines.

a. Air quality regulations

NAAQS Pb EPA in 1978 promulgated a National Ambient Air Quality Standard (NAAQS) for lead of 1.5 ug/m^3, measured as a quarterly average (40 CFR part 50.12). An ambient air monitor measures lead generated from a point source or from mobile sources. High-volume samplers take a 24-hour sample at a maximum interval of every six days throughout the quarter. A violation of this standard would occur if one of these samples exceeded 22.5 ug/m^3 of lead even if the remaining 14 samples were 0 ug/m^3.

To apply this standard to lead paint removal, one can calculate the number of work days for the quarter and the number of hours of paint removal for a 24 hour period. For example, if the work interval is 30 days and paint removal is conducted 8 hrs/day, then the NAAQS standard for lead would be violated if one measures a mean concentration greater than 13.5 ug/m^3 lead during the time that lead paint is removed. It may take many weeks to completely remove the exterior paint from a large bridge or water tank with abrasive blasting. No air monitoring by the MPCA has been conducted at steel structures that have been sandblasted in Minnesota. However, air samples have been collected and analyzed for lead at a number of sites in the United States where lead paint has been removed by abrasive blasting.

Lead concentrations in the air were measured where lead paint was removed from the girders of an 8-lane bridge in Illinois (personal communication W. Flannigan, ILDOT). Woven containment screens attached from the outside of the bridge deck extended to the ground and negative air and dust collection were used. All the coatings on the two outer beams contained red lead while only the primer paint on the inner beams was red lead. Recyclable steel abrasive was used for all the paint removal and surface preparation. The waste material was 12.5 percent lead by weight and contained more particles of steel grit and corrosion products than paint particles.

Both PM10 and TSP monitors were positioned 50 to 75 ft outside the containment (personal communication G. Russell, TTR, Inc.). The TSP samples were analyzed for lead particulates. The TSP monitors collected 16 eight hour samples over nine days of paint removal. The maximum value measured was 352 ug/m^3 lead for the eight hour sampling period. Seven of the samples were greater than 100 ug/m^3 lead. The position of the sampling equipment in relation to the source and to wind direction and the wind speed will largely determine the results obtained by air monitoring. The highest values will be measured in the area of greatest concentration of contaminants that occurs in the direction and at the distance of the monitor. This was one of the first "total containment" projects for this highway department and the first for the contractor. There was a loss of waste material at the seals and at times significant visible emissions were observed.

A study conducted by North Carolina Department of Transportation (NCDOT) included air monitoring at an overtruss bridge with red lead primer that was sandblasted inside total enclosure with negative air (rf. 16). This was a pilot maintenance project done in 1988. Samples collected outside the containment directly beneath the bridge during paint removal measured 300 ug/m^3, 710 ug/m^3, and 1700 ug/m^3 of lead in air. Containment efficiency of this project was calculated at only 60.7 percent.

Air monitoring with personal samples was done outside the containment area by NCDOT at two other bridge repainting projects done in 1991 (rf. 17). These were both girder bridges from which lead paint was removed with abrasive blasting in total containment under negative air. A minimum of two personal monitors were operated daily during abrasive blasting and priming on both bridges. According to the report they were positioned "...to collect the maximum emissions from the containment enclosure and equipment that might emit dust." None of 86 filter cassettes recorded concentrations of lead greater than 200 ug/m^3. Fifty of the samples measured less than 10 ug/m^3 Pb, 24 were 10 to 49 ug/m^3, seven were 50 to 99 ug/m^3, and five were between 100 and 199 ug/m^3 Pb.

A high-volume sampler was also used beneath one of the bridges to measure lead emissions in the ambient air. The monitor was positioned beneath one end of the bridge that was 1,228 ft in length. Air samples were taken every six days. The largest daily concentration of lead in air was 1.075 ug/m^3. The mean calculation for that quarter was only 0.102 ug/m^3.

The NCDOT report states "..there was usually some emission observed during the daily blasting and clean-up operations. It was virtually impossible to provide adequate containment for every steel shape and configuration." The contractor was shut down whenever visible emissions exceeded 1 percent of the time, i.e., 36 seconds in one hour. Visible emissions were documented from 6.4 percent to 11.4 percent of total blasting and clean-up time on one bridge and from 1.7 percent to 10.0 percent of time on the second bridge. Despite this, a containment efficiency of 96.4 percent was calculated on the first structure and 90.5 percent on the second. This rate of recovery was determined by adding the weight of abrasive used to the estimated weight of paint and millscale removed, and comparing this to the weight of debris that was collected.

The efficiency of pollution control where lead paint is removed in total containment with negative air will be determined by the capacity of the dust collectors, the volume of the enclosed space, the rate of paint removal, and the "tightness" of the containment. On these two projects 18,000 cubic ft per minute (cfm) dust collectors were used with maximum volumes of containment of 16,000 ft^3 and 14,000 ft^3, respectively.

A study of different air emissions generated during the repainting of the Bourne Bridge in Massachusetts included air lead concentrations (rf. 4). No containment was implemented during lead paint removal with a silica sand abrasive. Five high-volume air samplers were used to measure both lead and TSP in the vicinity of the bridge. The samplers collected 24 hour samples and were operated continuously during the 19 month maintenance project. Four of the highest daily concentrations of lead in air were above 0.90 ug/m^3 and one was above 1.0 ug/m^3. The greatest quarterly averages, however, were only 0.17 ug/m^3 and 0.16 ug/m^3 of lead. Therefore, there were no violations of the federal ambient air standard for lead.

EPA has reviewed the ambient air standard for lead in light of recent health effects studies. In draft recommendations in 1989, EPA staff proposed a monthly averaging period, daily sampling frequency, and lowering the NAAQS for lead to O.75 ug/m^3. The Clean Air Scientific Advisory Committee has reviewed the proposed changes, but promulgation of the new standard has been delayed at EPA. Each of these proposed changes would have a more restrictive effect on activities that discharge lead emissions to the air. Halving the standard would mean increased likelihood of NAAQS violations at all uncontained abrasive blasting of lead paint. Reducing the averaging period to one-third the present interval would likewise result in noncompliance for uncontained operations on even smaller steel structures with shorter work schedules. Daily sampling rather than sampling every sixth day would have the same effect of increasing the calculated concentration of lead in the monthly averaging period, if the sampling days coincided with the days of paint removal. This would increase the likelihood of violations for all sizes of steel structures.

Certain of the containment provisions in the proposed rule will reduce lead concentrations in the ambient air during abrasive blasting, thereby promoting compliance with the present ambient air quality standard for lead or with a more restrictive standard that might become effective in the future.

NAAQS PM10 On July 1, 1987, EPA promulgated a NAAQS for PM10 that replaced the TSP standard. The PM10 standard restricts emissions of particulate matter smaller than 10 microns to a concentration of 150 ug/m^3 as a 24-hour average, with no more than one expected exceedance per year (40 CFR part 50.6). There is an annual standard for PM10 of 50 ug/m^3 measured as an arithmetic mean. The daily standard is known to be violated when steel structures are sandblasted with silica sand without enclosure.

For example, in one study of sandblasting in a steel fabrication yard, the time-weighted average concentration of respirable dust was 37,250 ug/m^3 where blasting occurred more than five hours in the eight hour period (rf. 20). Respirable dust was defined as particles smaller than 10 microns in diameter, or PM10. The abrasive was silica sand. The average concentration of free silica in these samples was 83.6 percent. These values were measured by personal air samplers outside the hoods of sandblasters. Sandblasting steel surfaces with silica sand generates much small particulate because of the fracturing of the abrasive particles in addition to the generation of dust from the substrate and from any coating that is present. Silica sand has been widely used in sandblasting activities throughout Minnesota in residential, commercial, and industrial applications. It is the least costly abrasive and it contains more than 99 percent free silica. Free or crystalline silica in respirable size particles causes silicosis under prolonged exposure by inhalation. Silicosis is a progressive fibrotic lung disease that is often fatal. There are National Institute of Occupational Safety and Health (NIOSH), Occupational Safety and Health (OSHA), and American Conference of Governmental Industrial

Hygienists standards to protect workers from the effects of long-term exposure to respirable free silica.

Emissions and concentrations were calculated for both total particulates and PM10 in a study that examined uncontrolled abrasive blasting of steel surfaces with silica sand (rf. 12). The purpose of the study was to develop emission factors for uncontrolled abrasive blasting for addition to EPA Compilation of Air Pollutant Emission Factors (AP-42). Three steel substrates were blasted in a wind tunnel under windspeeds of 5 mph, 10 mph, and 15 mph. With duplicate test runs a total of 18 sets of samples were obtained. The steel bodies were painted automobile hoods, unpainted (previously blasted) automobile hoods, and "heavily rusted tank sides." The maximum percentage of PM10 emissions for the clean surface, painted surface, and oxidized surface were 60 percent, 73 percent, and 51 percent, respectively. The corresponding concentrations of PM10 were 73.6 mg/m^3, 129.6 mg/m^3, and 33.4 mg/m^3 (73,600 ug/m^3, 129,600 ug/m^3, and 33.400 ug/m^3). These results and the total particulate values and emissions are summarized in this table.

test condition	total particulate conc. (mg/m^3)	total particulate emissions (kg/h)	percentage particulate emissions <10 um	PM10 conc. (mg/m^3)	total PM10 emissions (kg/h)
clean steel 5 mph	122.7	5.06	60	73.6	3.05
10 mph	168.7	18.4	12	20.2	2.19
15 mph	157.2	24.5	5	7.86	1.21
average	149.5			33.9	
painted steel 5 mph	167.0	8.42	22	36.7	1.86
10 mph	177.5	19.7	73	129.6	14.6
15 mph	158.4	23.9	10	15.8	2.40
average	167.6			60.7	
rusted steel 5 mph	141.2	7.65	23	32.5	1.76
10 mph	65.5	6.92	51	33.4	3.54
15 mph	195.3	27.9	3.3	6.44	0.93
average	134.0			24.1	

Average emission factors for total particulate (as weight of particulate per weight of sand) for all windspeeds were calculated at 0.063 kg/kg, 0.063 kg/kg, and 0.047 kg/kg for clean, painted, and rusted steel, respectively. The average emission factors for PM10 for all windspeeds were 0.0099 kg/kg. 0.022 kg/kg, and 0.0074 kg/kg for clean, painted, and rusted steel, respectively (rf. 12).

PM10 monitors were used in the study of lead paint removal from the bridge in Illinois discussed above. Eighteen 8-hour samples were collected over nine days of paint removal with the containment described in the previous section. Only seven of the 18 samples were less than 150 ug/m^3. The standardized concentration for an 8-hour workday would be 450 ug/m^3. Five samples exceeded this standard. The highest measured concentrations for PM10 were 837 ug/m^3, 713 ug/m^3, and 698 ug/m^3.

There are two areas in Minnesota that are currently non-attainment for PM10 because of violations of the 24-hour federal standard. In addition to the TSP standard cited above, already adopted, Minnesota adopted the federal PM10 standard as a state standard on September 13, 1994.

In the Bourne Bridge study (rf. 4), air samples were also collected to measure emission factors. Approximately 7 percent of the total particulates generated by sandblasting were smaller than 10 microns (um) in diameter and 10 percent of particulates were smaller than 15 um. Particles of these sizes are considered to be respirable. The median size particle was 70 um in diameter. In even relatively low windspeeds, these particles will remain airborne for hundreds of ft (see also III.B.1 and B.2 below). This study was conducted before the NAAQS for PM10 was promulgated so no air monitoring was done for only particulates of this size.

As stated above, air monitoring has measured exceedances of the national PM10 standard where abrasive blasting of painted steel structures is done without containment or measures for dust abatement. In fact, violations of the adjusted daily standard have been documented even with containment. Although this consideration is secondary to the issue of lead contamination, it is evident that pollution control measures are a necessary condition of abrasive blasting methods of paint removal. Because such restrictions are incorporated in the proposed rules. the rules will aid in achieving the ambient air quality standard for PM10 and for lead.

b. Soil lead guideline

A directive from EPA Office of Solid Waste and Emergency Response (OSWER) of September 7, 1989, "Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites," provided that soils should not exceed a concentration of 500 to 1,000 ppm total lead. These numbers were adopted from the recommendation of the U.S. Department of Health and Human Services, Centers for Disease Control (CDC), in the January 1985 publication "Preventing Lead Poisoning in Young Children." The most recent of these reports by CDC was issued in 1991 (rf. 7). EPA has reviewed the cleanup standards for lead in soil at Superfund sites using the Integrated Exposure Uptake Biokinetic model. Standards for residential property are determined by an examination of human lead exposure from different media. A linear equation that adds risks is applied to non-residential sites. In the OSWER "Revised Interim Soil Lead Guidance for Comprehensive Environmental Response, Compensation and Liability Act Sites and Resource Conservation and Recovery Act (RCRA) Corrective Action Facilities" (OSWER Directive No. 9355.4-12) of July 14, 1994, a threshold number of 400 ppm is cited for residential properties for RCRA corrective actions and Superfund cleanups. This value is a "screening level" and not necessarily a "cleanup standard." The MPCA Solid Waste Site Response uses a value of 400 ppm for "unrestricted" land use (including residential) and 1,000 ppm lead for industrial land use for voluntary cleanups and for Superfund sites.

EPA Office of Pollution Prevention and Toxics issued "Agency Guidance on Residential Lead-based Paint, Lead-contaminated Dust, and Lead-contaminated Soil" on July 14, 1994 (rf. 27). Because of section 403 of Title IV, EPA is required to issue national lead standards for these media. This guidance document was prepared to provide interim values until regulatory standards are promulgated pending additional review and study. "..the Agency recommends that further evaluation and appropriate exposure-reduction activities be undertaken when [bare] soil lead concentrations exceed 400 ppm at areas expected or intended to be used by children."

The provisions for ground cover and cleanup in the proposed rules should prevent such increments in lead concentrations on residential property. As stated above, unrestricted abrasive blasting causes very large increments of lead added to soil.

c. **Hazardous waste regulations**

Industrial wastes are evaluated by the TCLP test to determine if they constitute hazardous waste. The standard for lead for the TCLP or "leach test" is 5 mg/l. The concentration of lead that leaches in these waste products will depend on the concentration of lead in the paint and the concentration of paint in the waste material. Before the TCLP test, the Extraction Procedure Toxicity (EP Tox) test was used to determine if a waste was hazardous. The TCLP test took effect for large quantity generators on September 25, 1990, and for small quantity (< 2200 lbs/mo.) generators on March 29, 1991. Data from lead paint removal waste in the state include both TCLP and EP Tox results. Sandblasting waste collected from bridges in Minnesota was sometimes hazardous with the EP Tox test. Unless additive products are used with the abrasive, these wastes are hazardous with the TCLP test. The coatings themselves, as sole constituents of a waste produced by paint removal, would be hazardous, not only on bridges, but on many other steel structures (see part III.B.2 below for data for both total test for lead and leach test for lead for paint samples and for abrasive waste samples.)

EPA proposed in May 1992 to adjust the "reportable quantities" (RQ) for 30 different wastes that contain lead that are listed under the RCRA and for RCRA characteristic wastes that fail the TCLP based on lead constituents. A release into the environment of a hazardous substance in an amount equal to or greater than the RQ must be reported immediately to the National Response Center. The statutory RQ for lead-containing TC wastes had been one pound. In the final rule, which took effect June 30, 1993, EPA increased this to 10 pounds (40 CFR 302.4). The quantity of lead paint waste released during paint removal procedures from steel structures depends on the size of the structure, the thickness of the coating, the concentration of lead in the coating, the method of removal, and the effective use of pollution control during paint removal. Different systems of containment are capable of achieving different containment efficiencies. The weight of coatings on a moderately sized steel structure can be many hundreds of pounds. The largest structures can bear many thousands of pounds of coatings that contain lead (see also part III.B.2 below).

d. **Title X: Residential Lead-Based Paint Hazard Reduction Act of 1992**

Title X, the "Residential Lead-Based Paint Hazard Reduction Act of 1992" was signed by President Bush on October 28, 1992. This law is part of the Housing and Community Development Act of 1992 (PL102-550). It is directed at the training and licensing of residential lead paint abatement contractors. Subtitle B of this bill amends the Toxic Substances Control Act (15 U.S.C. 2601 and following seq.) by adding Title IV "Lead Exposure Reduction." In section 402 "Lead-based Paint Activities Training and Certification" it states, "For purposes of this title, the term 'lead-based paint activities' means -- (1) in the case of target housing, risk assessment, inspection, and abatement; and (2) in the case of any public building constructed before 1978, commercial building, bridge, or other structure or superstructure, identification of lead-based paint and materials containing lead-based paint, deleading, removal of lead from bridges, and demolition." The insertion of the phrase "bridge, or other structure or superstructure" adds regulation of steel structures to residential "target housing," public buildings, and commercial buildings. The federal government is proceeding to regulate the removal of lead paint from industrial structures. EPA published proposed regulations under Title X on September 2, 1994, and intends to promulgate final rules by January 1996. MPCA staff wrote comments to EPA regarding the proposed regulations that apply to steel structures (exh. 19).

The states must either adopt the federal regulations or submit their own regulations for approval. The Title X statute includes a "model state program" that "may be adopted by any State which seeks to administer and enforce a State program under this Title." States have two years from promulgation to have a program authorized and in effect. If a state has not had a state program approved by EPA by that time, EPA shall "...by such date, establish a Federal program for section 402...for such State and administer and enforce such program in such State." This legislation requires that EPA "encourage" states to adopt their own programs. However, EPA can authorize a state program "...only if..the Administrator finds that--(1) the state program is at least as protective of human health and the environment as the federal program under section 402...and (2) such state program provides adequate enforcement." The rules proposed here will constitute a significant part of the state program for Minnesota.

3. Inadequacy of existing regulations

As stated above, existing Minn. Rules pts. 7011.0150 and 7011.0110 can be applied to abrasive blasting activity of all kinds and indeed they have been so used. However, these rules are not adequate to prevent lead contamination from abrasive blasting. Furthermore, the applicability of either of these rules to other methods of paint removal is problematic. They are designed to reduce emissions of particulate matter from any source regardless of the presence of lead. They do not specify the procedures that will reduce lead contamination from abrasive blasting of steel structures or from any other method of paint removal. In addition, violations of these rules during abrasive blasting do not necessarily result in lead contamination. For example, abrasive blasting of steel surfaces that do not bear paint that contains lead can result in generation of particulate matter and significant visible emissions, but does not result in lead contamination.

Furthermore, compliance with either of these rules regarding emissions of particulate matter does not ensure that there is no lead contamination of the environment or exposure of the resident population to lead paint particles. Both "reasonable measures" can be used or "avoidable amounts" of dust can be prevented, according to Minn. Rules pt. 7011.0150, and yet significant contamination with lead paint particles can result. In practice, the "fugitive dust" rule is a nuisance dust rule. The selective use of this rule in only those circumstances where lead paint is removed presents also the problem of consistent and uniform enforcement. It is reasonable, however, to apply very general regulations more vigorously where contamination with heavy metals is a concern.

Similarly, visible emissions that exhibit less than 20 percent opacity (Minn. Rules pt. 7011.0110) can still cause widespread dispersal and large amounts of deposition due to paint removal. Existing MPCA Air Quality rules are not sufficient to prevent lead contamination caused by abrasive blasting and other methods of removal. Neither of these regulations nor their application are commensurate with the serious consequences of lead paint removal. It was for this reason that recommendations were developed and distributed to local units of government, contractors, and consultants, as described in the Introduction (part I. above). Specific standards are therefore needed to reduce lead contamination from this activity.

In the past, the "boilerplate" language regarding pollution control in special provisions, which supplemented MnDOT bridge maintenance contract specifications.

excluded sandblasting waste, including paint particles, from the term "waste materials." For example, the provision supplement from 1985 said, "Painting, and all work associated therewith, shall be so conducted as to preclude waste materials from falling upon public waters. The contractor shall contain waste materials on the project site and provide for their disposal in accordance with Minnesota pollution control laws and regulations. Waste materials are defined as paint overspray and drippings, used paint pails, rags, spent solvents, cleaning solutions, and debris from cleaning operations, but not sand or paint chips." This is essentially the same language as in the provision supplement of 1978. In special provision supplements to specification 1717 for lead paint removal projects dated 1989 and 1990, this identical text is used. This same language continued to appear in some contracts for removal of paints containing lead in 1991 and 1992. However, in other contract supplements since 1989 the last sentence has been changed to read, "Waste materials are defined as used paint pails, rags, spent solvents, cleaning solutions, and debris from cleaning operations including sand or paint chips." In 1992 the word "sand" was changed to "spent abrasives."

Of course it is inappropriate to exempt used abrasives and paint particles from the definition of "waste materials" in a statement that requires containment where lead paint is removed from a bridge. According to MnDOT, this provision is so worded to address disposal in certain contracts. In recent years, MnDOT has maintained ownership of paint removal waste and assumes responsibility for its disposal. This inconsistent language has created problems for contractors who must bid the project, but are not sure what pollution control requirements are appropriate for the bridge maintenance work, and which ones will be implemented or enforced (see also part III.B.2. below).

In a section of these supplemental provisions titled, "Use when required by pollution control and fish and wildlife agencies," it states, "Materials such as paint chips and sand which are readily recoverable from bridge decks or stream banks..." shall be transported to a landfill for disposal. Further, "Paint chips and spent sand shall be removed from the bridge deck on a daily basis and in an approved manner." It is readily observed that only a small fraction of abrasive blasting waste produced without containment will deposit on the bridge deck itself. "Readily recoverable" quantities from areas beneath the bridge are likewise a small portion of the waste generated. This same language also continued to appear in a small number of contracts for removal of paints containing lead in 1991 and 1992 (see also part III.B.2. below).

In summary, MnDOT contract specifications and supplement provisions have required pollution control in some contracts since 1989 where lead paint is removed from a bridge. Oftentimes, however, this language has not been implemented by the contractor or the project engineer or field inspector. In addition, on a large number of bridge maintenance projects, the specification of pollution control has been inadequate.

A number of factors, including the additional cost of proper containment and cleanup or of alternative methods of paint removal, and unfair competition between consultants and contractors that do relatively "clean" jobs, and those who are less careful, act to prevent self-regulation by the steel structures industry. This is true whether the steel structure is a bridge, a water tower, or anything else that bears deteriorated lead paint. When the contract specifications for environmental protection are deficient in their requirements, the owner of the structure will reduce the costs of doing maintenance repainting. When such specifications are adequate but are not implemented by a painting contractor, the contractor company will reduce its costs and increase its net income.

EPA did not propose new standards to address the removal of lead paint from steel structures in September 1994 under Title X, but rather referred to existing "...Federal, State, and local environmental regulations" in section 745.228 (i)(4)(ii). The removal of lead paint from steel structures without pollution control <u>can</u> violate a number of existing regulations that include state rules and statutes, as well as federal standards and guidelines. These have been discussed above. Among these are air emissions rules, soil lead standards, lead in housedust standards, hazardous waste regulations, and water quality regulations. However, reference to existing regulations does not address the purpose of Title IV of Title X, sec. 402 (a)(1) which states that EPA shall promulgate final regulations that contain "standards for performing lead-based paint activities." Very few states have regulations that provide standards for removal of lead paint from steel structures. MPCA staff does not believe that EPA's proposed rules provide environmental protection necessary to prevent serious lead contamination and risk to the public health when lead paint is removed from steel structures. If EPA does not include such standards in the final Title IV rules, EPA could, as an alternative, require each state to develop specific regulations to meet minimum criteria set forth in the final federal rules. Without a legal challenge, it is more likely that EPA will encourage individual states to develop such standards as part of each state's regulatory program for lead paint.

As described in the Introduction (part I. above), provisions for the removal of lead paint from water towers and bridges were prepared and distributed to cities, counties, and townships, and to a great number of individuals throughout the state in 1990 (exh. 6). Because recommendations do not have the force of law, it has been necessary in the past to cite state rules regarding air emissions, soil lead standards, and hazardous waste requirements in order to promote conformity to their provisions. Recommendations are not adequate to protect the environment and the public health from lead contamination, because in themselves, they do not require compliance by contractors nor are they enforceable by the MPCA. In addition, the recommendations of 1990 are not comprehensive enough to address each kind of steel structure that bears lead paint or all the different factors that affect potential contamination from lead paint removal. These considerations are incorporated in the proposed rules. MPCA staff is persuaded that the widespread presence of exterior lead paint on steel structures in Minnesota, the concentrations of lead in those coatings, and the very serious health and environmental effects of lead exposure require regulation of exterior lead paint removal.

B. Need to Prevent Lead Contamination Due to Removal of Lead Paint from Steel Structures.

1. Lead paint on steel structures

Compounds of lead pigments and chromium pigments have been used in coatings on steel surfaces, because they act as corrosion inhibitors. Because of this, they are most often present in primer coats and not in intermediate coats and finish coats. There are some structures, however, that have lead in all exterior coatings. Lead paint has been used on steel structures throughout the United States.

Lead compounds are called indirect inhibitors, because they react with acidic compounds in the vehicle, often linseed oil or alkyd, to form lead salts (rf. 11). These are partially soluble in water and migrate to the steel surface where they are adsorbed as passive films. The development of this film on the steel electrode is called polarization. It has the effect of increasing electrical resistance that reduces or stops electrochemical reactions that might occur between heterogeneities on the steel surface. Some of the lead pigments that are used on steel structures to protect against corrosion are red lead, lead suboxide, and basic lead silico-chromate (BLSC). Chromate pigments used in protective coatings are direct inhibitors. They contain hexavalent chromium, and they are partially soluble in water. Lead chromate paints and basic lead-silico chromate paints contain both lead and hexavalent chromium.

Red lead/linseed oil paint was first used as a primer on structural bridge steel in the early 1800's in England (rf. 11). It has been widely used since then in the United States. It is often used in a three coat system that includes red lead in the primer and red lead/iron oxide in the intermediate coat. At least six states continue to use red lead paint on new bridge construction. BLSC with linseed oil vehicle was first introduced in the late 1950's. It is often applied in a three coat system that includes BLSC in all coats. About 20 states continue to use BLSC systems for new bridge construction. The formulations of these lead coatings on bridges differ from state to state, but are generally similar in lead concentration.

Other steel structures have also been coated with lead paint. The American Water Works Association (AWWA) standard for "Painting Steel Water-Storage Tanks" (ANSI/AWWA D102-78) (rf. 2) specifies five different "outside paint systems" for exterior surfaces of steel tanks. Three of the five systems specify a "prime coat of red-lead pigmented alkyd paint." Although this specification was approved in 1978, it is still current.

2. Steel structures in Minnesota

Steel structures in Minnesota that bear exterior lead paint include the steel girders and trusses of bridges; water tanks; fuel tanks; chemical storage tanks; fertilizer tanks; grain storage bins; railcars; pipelines; and industrial equipment of utilities, power plants, water and waste treatment plants, pulp and paper mills, chemical plants, food processing plants, petroleum refineries; and such assorted structures as transformers, transmission towers, outside metal sculpture, parking ramps, and facades and other exterior components of buildings.

The quantity of lead in the paint on any one structure is a function of the concentration of lead in paint, the surface area, and the number and thickness of the coatings that contain lead. Both the concentration of lead in the exterior coatings and the amount of coating on the surface differ with individual structures. The height of the structure is an important variable that affects the distance of dispersal of paint particles and the area of potential contamination when lead paint is removed.

These structures are characterized also by their surroundings, which differ in the kind of neighboring properties that can be contaminated by lead paint particles. These structures also differ in their pattern of distribution throughout the state.

a. Water storage tanks

Water tanks are found in virtually every municipality. Minneapolis may be the only municipality in Minnesota that does not own an above ground water storage tank. On the other hand, the metropolitan suburb of Cottage Grove has six water storage tanks while the city of Rochester has 13 steel water storage tanks. There are 855 municipalities in Minnesota and the larger cities have several water tanks. In the seven-county metropolitan area alone there were 265 municipal water tanks in 1990. Approximately 210 to 225 of these are either steel ground storage or elevated tanks (personal communication G. Oberts, Met Council & D. Clark, MDH). There are approximately 1,000 steel municipal water tanks in the state. Additional water tanks are sited on industrial and other private property throughout Minnesota.

Water tanks can be ground storage tanks, standpipes, or water towers. There are more water towers owned by municipalities in Minnesota than standpipes or ground storage reservoirs. Water towers are of three general type elevated multileg tanks, pedestal column spherical tanks, and single fluted column tanks or hydropillars, each with a different structural configuration. Each type of tower has a different exterior surface area for a given volume capacity. Pedestal column spherical tanks have the smallest surface area per volume and elevated multileg tanks have the greatest. This table provides some comparative surface areas for three fairly standard capacities of elevated water tanks.

Exterior Surface Area of Water Tanks by Volume

reservoir volume	pedestal column tank	fluted column tank	multi-leg tank
250,000 gal	8,700 ft^2		12,700 ft^2
500,000 gal	12,750 ft^2	19,300 ft^2	19,600 ft^2
1,000,000 gal	20,450 ft^2	33,250 ft^2	36,900 ft^2

(from brochure "Tnemec water tank coatings"(1988), Tnemec Co., Inc.)

The table below provides the distribution of total lead concentration in exterior coatings for a sample of 39 different water tanks in Minnesota. Ten of these tanks (25.6 percent) had levels of lead below the definition of lead paint in the proposed rules (0.5 percent). The highest value of lead in paint on an elevated water tank in Minnesota reported to MPCA air quality staff is 37.0 percent.

Lead Concentrations in Ext. Paint of MN Water Tanks

< 0.5 %	< 1.0 %	1 % - 5 %	5 % - 10 %	10 % - 20 %	> 20 %
10	14	8	9	4	4

N = 39

The total amount of lead in paint on the water tanks of the state is estimated at about 150,000 pounds.

b. Fuel storage tanks

There are 10,661 active chemical and petroleum storage tanks registered in Minnesota as of February 3, 1994. These are distributed over 3,904 registered tank sites. These tanks range in size from volumes less than 250 gallons to a maximum of 21 million gallons. These are all "ground storage tanks" according to the definition in the proposed rules. Large volume tanks like these are also called "flat-bottomed tanks." The larger of these fuel and chemical storage tanks would generally be concentrated in industrial areas, often in "tank farms" that might number up to 80 individual tanks. There are 257 tanks with a capacity equal to or greater than 1,000,000 gallons and 10 tanks with capacities of 10 million gallons or greater. The total volume of chemical and petroleum storage tanks in Minnesota is about 1.65 billion gallons. The mean volume of an active chemical or petroleum storage tank is 154,708 gallons.

The exterior surfaces of these tanks are frequently coated with lead paints, which when removed, can cause significant contamination. The quantity of lead removed from these structures is largely a function of the exterior surface area. Some examples of the surface areas calculated for specific types of fuel storage tanks are provided by this table:

Exterior Surface Area of Fuel Tanks

roof type	volume	height	diameter	surface area
cone	20,000 bls (840,000 gals)	40 ft	60 ft	10,600 ft^2
flat	30,000 bls (1,260,000 gals)	41 ft	73 ft	13,588 ft^2
floating	100,000 bls (4,200,000 gals)	50 ft	90 ft	20,500 ft^2

bls=barrels
gals=gallons

A 500,000 gal ground storage tank with a height of 48 ft would have an approximate surface area of 7,743 ft^2. One million and 5,000,000 gal ground storage tanks that are 48 ft in height have approximate surface areas of 11,766 ft^2 and 34,008 ft^2, respectively. The average volume of all fuel and chemical storage tanks registered in the state is 154,708 gals. This average tank would have a surface area of approximately 3,353.5 ft^2 and would carry about 13.4 gallons of primer paint in the dried film. If this paint contained 27 percent $PbSiCrO_4$ by dry weight, this average storage tank would have about 43.4 lbs of lead compound in its coatings.

Using these figures, the estimated amount of lead compounds in the painted surfaces of chemical and fuel storage tanks in the state is about 460,000 pounds.

c. **Bridges**

Steel bridges are located where roadways traverse waterways, at grade separations, where two roadways intersect, or where a pedestrian or railway bridge crosses a roadway. These structures are limited to trafficways and are more concentrated in populated areas, or where railways or roadways meet waterways.

There are 7,920 steel bridges in Minnesota. Of these, 1,649 (20.82 percent) are MnDOT bridges on state and federal highways. Included in these numbers are 393 steel railway bridges of which 163 cross state or federal roadways and are part of the MnDOT system.

Other railway bridges traverse waterways in the state. Of MnDOT bridges, 1,216 have been painted with a lead paint. Although the city, township, and county bridges are generally smaller structures, they are nearly four times more in number.

Synder and Bendersky (rf. 23) in 1983 published the earliest comprehensive study on the subject of removing lead paint from bridges. They reviewed environmental regulations; lead contamination information; methods of lead analysis; and methods of paint removal, containment, and recovery; as well as the costs of these systems. Among the steel structures that are the subject of this rulemaking, bridges are the best known in terms of paint constituents and environmental effects. These structures are well inventoried and those owned by MnDOT are relatively well documented in terms of surface areas and paint constituents. Bridges comprised the first subjects of MPCA staff investigation when rule review was initiated. The most complete data of environmental contamination as a consequence of lead paint removal from steel structures in Minnesota was produced in the study of sandblasting lead paint on bridges (exh. 2). Since that time other studies have been completed in the United States

Most of the steel bridges in Minnesota painted or repainted before the late 1970's are coated with lead paint. Organic zinc-rich primers have since been substituted for lead paints on new bridges and on bridges where the entire old coating is removed under contract during maintenance repainting. Although the first bridge coated with organic zinc was painted in 1973, according to a MnDOT Bridge Inventory (01/22/86), lead paint continued to be used through 1985 and perhaps later. In 1984, 13 bridges were partially or wholly repainted with red lead primer and four were repainted with red lead iron oxide primer. In 1985, two bridges were repainted with red lead primer. When one subtracts those bridges that have been repainted without lead paint, there are still more than 1,000 bridges on state and federal highways in Minnesota that presently bear lead paint.

MnDOT Standard Specifications for Construction describes the formulations of different coatings used on bridge steel. From this information, one can calculate the concentration of lead as a constituent of the paint as either "wet weight" or "dry weight." The 1959 edition specifies four different lead paints for use on bridges. Red lead is the most common primer paint on steel bridge beams and trusses in Minnesota. The lead compound in red lead is lead tetraoxide, Pb_3O_4. In this early formulation, red lead paint contains a minimum 77.91

percent lead in whole paint and 79.87 percent lead in the dry film. One gal of red lead paint contains a minimum of 20.45 pounds of lead compound. Although it is specified as a primer coat, a number of bridges in the state also have red lead intermediate coats and finish coats. In the 1983 edition of the MnDOT specifications book, there are seven different paint compositions with lead that are listed for use on bridges. In the 1988 edition of MnDOT specifications, there are five formulations of bridge paints that contain significant amounts of lead. In these last two editions, red lead is found in formulations for intermediate and finish coats, but not primer coats, and at lower lead concentration than that cited above.

Red lead iron oxide paint contains a minimum 56.65 percent lead by wet weight and 57.42 percent lead by dry weight. One gal of red lead iron oxide paint contains a minimum of 12.46 pounds of lead compound. BLSC and red lead iron oxide are also widely used as protective primers on steel bridges. They have also been used in intermediate and finish coats, although these formulations generally contain a lower concentration of lead in the pigment than the primer coat. Lead silico-chromate primer contains a minimum 60.16 percent BLSC by wet weight and 67.72 percent BLSC by dry weight. In the American Society for Testing and Materials (ASTM) standard specification for BLSC pigment (D 1648-86), an average of 47.5 percent of pigment is lead oxide (PbO) and 5.4 percent is chromium trioxide (CrO_3). Using this composition, BLSC primer is 28.58 percent lead by weight in the whole paint and 32.17 percent lead by dry weight. One gal of BLSC paint contains a minimum of 8.96 pounds of BLSC or 4.26 pounds of PbO.

A steel bridge of mean length and width might bear 1,000 to 2,000 lbs of lead by dry weight. The largest structures can carry more than 20 times this quantity. One of the larger beam bridges in the state, with 508,000 ft^2 of steel surface area carried approximately 46,175 lbs of lead tetraoxide in the red lead primer. This coating was entirely removed by abrasive blasting and deposited on the soil, and hard surfaces beneath the approaches, and in the water beneath the center span.

Because they have more surface area of steel, truss bridges will bear more paint than beam bridges of the same length and width. An over-truss bridge with 74,820 ft^2 of steel surface area that was coated with a red lead primer and a red lead finish coat carried a minimum of 13,600 lbs of Pb_3O_4. However, because this structure had an unusual thickness of coating, the actual quantity of lead compound that was removed by sandblasting may have been three times this weight. A single curtain suspended on one side of this bridge and ground covers under the approaches were not adequate to collect more than a small amount of the waste material. Most of the lead paint particles deposited in the river and along the banks.

By fairly conservative estimate, using 2,000 lbs of lead compound (e.g. Pb_3O_4) per bridge, 2,000,000 lbs of lead would remain on MnDOT bridges alone. If one estimates the mean size bridge in the state owned by the cities, townships, and counties to have a quarter of the surface area and a quarter of the lead per bridge of the mean MnDOT bridge (i.e., 500 lbs), these structures would add another 3,000,000 lbs of lead compound to the coating of bridges in the state's infrastructure. This amounts to some five million pounds of lead substances on these structures alone.

Significant contamination of soil and surface water is caused by removal of lead paint from steel bridges as it has been conducted in Minnesota. This is documented by the field study conducted by MPCA staff in 1987 and reported as "Lead Contamination of Soil by Sandblasting of Bridges" (exh. 2). As stated above, bridges were the first subject of study in a rule review of lead paint removal from steel structures. At the time, there was very little data of lead concentrations in any media as a consequence of dry abrasive blasting of lead paint on bridges. Soil samples were taken before and after sandblasting at three bridges to measure the effect of this practice on lead contamination of soil. Samples were generally collected in transects perpendicular to the axis of the bridge. The bridges were of different sizes--pedestrian, two-lane, and four-lane structures--all of girder construction. The smaller bridges crossed a four-lane divided highway while the four-lane bridge traversed a waterway. Each bridge was painted with red lead primer and phenolic resin aluminum finish coat. No containment or cleanup was conducted at the sites where samples were taken. Because these bridges either traverse or are part of a state or federal highway, they are maintained by MnDOT. Because they were entirely repainted, the work was contracted.

At the pedestrian bridge, the maximum value of the 18 samples taken before sandblasting was 363 ppm lead. After sandblasting, four samples exceeded 1,000 ppm lead and the greatest increase was 1234.5 ppm or 724.7 percent. At the two-lane bridge, the largest concentration of 12 samples taken before paint removal was 623 ppm. All of the after samples exceeded 1,000 ppm with the greatest increase being 8,114.4 ppm or 8,622.3 percent. At the four-lane bridge, each of 10 samples increased from less than 350 ppm to more than 1,800 ppm. The greatest increase was 7,482.7 ppm or 2,189.2 percent.

There are millions of pounds of lead and thousands of pounds of chromium on MnDOT bridges alone throughout Minnesota. There are four times more bridges on city, county, and township roadways in the state. These structures constitute a significant hazard to the environment and to human health when these coatings are removed. It is essential that effective pollution control methods be implemented as part of paint removal in order to prevent violations of state rules and statutes, and to protect the environment and the public health.

d. Other steel structures

Other steel structures include railcars whose exterior surfaces have been coated with large quantities of lead paint throughout the United States. At one railcar repair and maintenance facility in Minnesota, sandblasting of lead paint was conducted for about 20 years on a large property that adjoined a residential community. Sandblasting was done outside without containment throughout the year. As part of a recent cleanup 6,460 yd^3 of sandblast sand were consolidated from nine different piles on the property. This material had not been contained or covered since it was generated.

The maximum total lead concentration in the largest original pile of sandblasting sand was 6,600 ppm. Of 97 samples of this sand, 78 exceeded 1,000 ppm and all 97 exceeded 300 ppm. Deposits in two other areas of the property were also sampled. The maximum concentration of lead in the waste in these two areas was 1,600 ppm. Of 27 samples of sand in one area, all but six samples exceeded 300 ppm. In the area with smaller deposits, five of ten samples exceeded 300 ppm.

As part of the assessment of the contamination of this site, soil samples were collected on and near two city ball fields, and a hockey rink adjacent to one area where sandblast sand had been disposed. Eight samples were taken to a depth of six inches beneath the surface and then mixed for analysis. The three highest of these eight samples were 260 ppm, 540 ppm, and 900 ppm lead. Contamination that is due to sandblasting of lead paint, or to secondary contamination from uncontained and uncovered sandblast sand, will deposit paint particles on the soil surface. Surface samples of the contaminated uppermost layer only (e.g. 2 cm depth) may show concentrations of lead in soil many times these reported quantities. In normal conditions of soil and precipitation chemistry, red lead particles will remain largely on the soil surface. Surface contamination presents the greatest risk to public health, in particular to children at play.

Apart from the deposits of sandblasting waste in "piles" on the property, three areas of contamination of "surficial" sands were identified where grids were used to locate samples of six inches of soil depth. In the first grid area 12 samples were taken with maximum values of 1,500 and 1,300 ppm total lead. In area two 13 samples provided a maximum concentration of 460 ppm. The greatest concentrations of 17,000 and 10,000 ppm were found in the smallest area where ten samples were collected.

A mean of eight railcars a day were repainted at this site throughout the year. Over 20 years, approximately 25,000 railcars with lead paint were sandblasted at this facility. Although non-lead paint began to be used in the early 1970's at this plant, railcars that were painted before then were sandblasted and repainted without pollution control up to the time the operation closed in early 1986. Each steel railcar has about 1,560 ft^2 of painted exterior surface area. About 10 gallons of red lead primer were used on each railcar. If this paint contained 20 pounds of lead per gal, then approximately 200 pounds of lead were carried in the surface coatings of each car and 5,000,000 pounds of lead were removed by sandblasting in the open air.

Other steel structures that are not storage tanks or bridges are river barges. The hulls of these vessels typically are not painted, but the decks and steel covers are. Rolltop covers have been painted with corrosion-inhibiting primers. As the steel begins to corrode, these coatings are removed and replaced. Only a little data from these structures in Minnesota is available. One sample from a deck top had only 0.028 percent total lead and a rolltop had 0.41 percent total lead. An additional sample collected by MPCA staff contained 0.10 percent. Barges on the Mississippi River have undergone large scale maintenance repainting in St. Louis and New Orleans. However, one barge service facility in Minnesota is considering a barge repainting operation that would maintain about 50 barges each year. These may be repainted in a procedure that removes existing paint inside a large building.

Steel on building fronts as well as exposed structural steel above commercial buildings or on building walls and facades can also contain lead paint. A paint sample from the ornamented metal facade of a downtown building that was being sandblasted contained 9.4 percent total lead. Steel sign supports on another downtown building are coated with a paint containing 22.29 percent total lead. Outdoor metal sculpture can bear lead paint to prevent corrosion. These structures are frequently sited in parks, gardens, and other public use areas where removal of the coatings can cause contamination of areas where children often play. A sample taken from the structural steel members of a botanical conservatory contained 4.2 percent total lead in the coatings that were sandblasted.

3. Health effects of lead

There is increasing activity at various levels throughout the country to address sources of lead in the human environment. Research has identified significant health effects of lead in children at levels of 10 ug/dl lead in blood. The most serious of these effects are on the central nervous system of infants and children, due to exposure of the pregnant mother or the individual child, and these impairments to cognitive function are considered to be irreversible. Lead also interferes with red blood cell formation and has deleterious effects on the kidneys, the peripheral nervous system, and the reproductive system. Additional effects include reduced birth weight and congenital deformities in children and increased blood pressure in adults. The Centers for Disease Control guideline for lead poisoning in children, issued in April 1978, set a standard of 30 ug of lead per deciliter (dl) of whole blood. This was reduced to 25 ug/dl in January 1985, and was lowered again in October 1991 to 10 ug/l, due to compelling evidence of deleterious effects of lead in the body at that level (rf. 7).

The proposed rule is limited in scope, bearing only on the removal of lead paint from steel structures. This present document does not intend to present a comprehensive toxicological or epidemiological review of the health effects of lead. As stated earlier, there has been relatively little study of the environmental or public health effects of abrasive blasting, or other methods of paint removal of steel structures. There is, on the other hand, a very large number of studies of the human health effects of lead absorption, sources of lead exposure, and the incidence and distribution of blood lead values in different populations. Two documents that provide comprehensive reviews of this literature are the EPA Air Quality Criteria for Lead (1986) vols. 1-4 (rf. 24) and the Agency for Toxic Substances and Disease Registry (ATSDR) The Nature and Extent of Lead Poisoning in Children in the United States: A Report to Congress

(1988) (rf. 1). A report Air Quality Criteria for Lead Supplement to the 1986 Addendum (1990) (rf. 26) updates recent studies on lead poisoning. The U.S. Department of Health and Human Services, Centers for Disease Control publication Preventing Lead Poisoning in Young Children (1991) (rf. 7) includes a recent list of important references. These reports provide summary reviews of the scientific literature on lead. These studies have identified significant differences in classroom performance and I.Q. test scores at relatively low levels of lead absorption, and have reinforced the need for prevention of these long-term effects by reducing exposure to lead.

There are two studies in particular that document two very important consequences of lead absorption on human health---the effects of low-level lead poisoning and the long-term effects of lead poisoning. Bellinger et.al. (1987) (rf. 5) studied the development of children from birth to two years old, correlated to levels of lead in the blood. Blood leads (BPb) were measured every six months. Mental Development Index test scores of babies with BPb's less than 3 ug/dl were compared to those of babies with BPb's equal to or greater than 10 ug/dl. The mean difference in test scores was 4.8 points. No child in the study had a BPb greater than 25 ug/dl and two-thirds of the high BPb group were between 10 and 15 ug/dl. Early cognitive development is affected at very low levels of lead in the body of infants.

Needleman et.al. (1990) (rf. 19) studied the persistence of effects of low doses of lead in childhood over an 11-year interval. Lead concentrations were first measured in tooth dentin in first and second graders. Those children with dentin lead less than 10 ppm were compared to those with dentin lead greater than 20 ppm. Eleven years later, a number of significant differences were identified between the two groups. The "high" lead children were 7.4 times more likely to drop out of high school than the "low" lead children. They were 5.8 times more likely to have a reading disability than those who had absorbed smaller amounts of lead. "..no current evidence suggests that treatment can reverse the neuro-behavioral deficits produced by lead poisoning. Hence, neuro-behavioral deficits produced by lead are considered "irreversible" by the American Academy of Pediatrics." (from an affidavit by J. Rosen, MD, (cited in rf. 6)).

Lead in paint presents a direct hazard to human health when it is ingested. Cases of acute lead poisoning of children have been most often attributed to eating pieces of house paint. In recent years, however, a number of studies have identified serious health effects in children due to chronic exposures to lead paint dust inside the home and to lead in outside soil and dust. This exposure often results in low-level absorption and subclinical health effects of serious consequence. Soil and dust in residential areas have been contaminated primarily by two sources: 1) the deposition of lead compounds from combustion of gasoline that contains lead, and 2) the weathering and the removal of exterior house paint that contains lead. These sources of lead contamination of soil and dust cause contamination of household interiors with infiltration by air movement and the traffic of people and animals from outside to inside the residence. When lead paint that is removed from steel structures deposits on residential property, it acts as a third source of lead contamination and lead exposure. A number of studies have determined that the pathway of lead poisoning in young children from outside sources of lead paint contamination is

$$\text{paint Pb} \rightarrow \text{soil Pb} \rightarrow \text{dust (ext.) Pb} \rightarrow \text{housedust Pb}$$
$$(\downarrow) \qquad \downarrow$$
$$\text{blood Pb}$$

In 1990, according to EPA, 10 billion gallons of regular grade gasoline were sold. In the mid-1970's. 100 billion gals/yr of leaded gasoline were sold. Before the phase-down of lead in gasoline began at the end of 1973, there were 2.3 grams (g) of lead in a gal of gasoline. Since January 1, 1986, the maximum lead content of regular grade gasoline has been 0.1 g/gal. This means there has been a 10-fold decrease in the volume of leaded gasoline sold and a 20-fold decrease in the concentration of lead in this fuel. As a result of these two effects, there is today 1/200th the lead added to the environment from the combustion of gasoline compared to the mid-1970's.

In contrast to this change, there has been no such state or federal restriction on the use of lead coatings on steel structures. Although the Consumer Product Safety Commission in 1978 prohibited the addition of any lead to household paint, it affected only paint used on interior and exterior residential walls, toys, and furniture. Reductions in the use of lead paint on industrial structures that have occurred in recent years have been largely initiated by paint manufacturers and by the owners of individual steel structures. Just as there remains a large amount of lead on soils due to past gasoline combustion, there remains a large amount of lead paint on steel structures across the United States and in Minnesota. In certain circumstances, removal of this paint can seriously contaminate both residential property and the larger environment.

EPA is examining sources of lead in different media and has proposed initiatives under the Toxic Substances Control Act to reduce sources of lead in the human environment. In November 1992, EPA reduced the standard for lead in drinking water from 50 mg/l to 15 mg/l. In testimony before Congress soon after her appointment, EPA Director Carol Browner said, "The reduction of children's exposure to lead is one of EPA's top priorities."

Several studies have focused on the occupational, public health, and environmental consequences of abrasive blasting and scraping of lead paint from the Mystic River Bridge in Massachusetts. This high suspension bridge, which joins Charlestown and Chelsea, was one of the earliest subjects of data collection to measure the effects of lead paint removal from a steel structure. This study was published in the New England Journal of Medicine in 1982 (rf. 14). Both soil and blood lead samples were collected before any paint was removed from the structure. The major source of existing lead in soil beneath the bridge was determined to be deteriorated paint on the bridge. These values were 1,300 to 4,800 ppm lead. A blood lead study was conducted in the neighborhood beneath one end of the bridge in Chelsea. The blood of 109 children living in blocks nearest the bridge was compared to that of 82 children living farther away. Forty-nine percent of those living near the bridge had lead levels equal to or above 30 ug/dl compared to 37 percent of those in the second group.

Abrasive blasting began in 1979 on the Charlestown end of the bridge. Samples of air, surface soil, house dust, and used abrasive were analyzed for lead content. Mean lead concentration of three samples of used abrasive was 8,127 ppm with a maximum of 12,900 ppm. Four high-volume air samples were collected at 27 m from the bridge. To contain the paint removal, the sandblasters worked inside moveable booths that were sealed to the bridge with canvas shrouds and maintained under negative air pressure. The mean of these samples was 5.32 ug/m^3 with a maximum value of 12.9 ug/m^3, measured when a canvas shroud was not in place during one-third of the 6-hour sampling period. Improved use of pollution control resulted in mean air lead concentrations of 1.43 ug/m^3 at 12 m from the bridge with a maximum of 3.54 ug/m^3.

Soil samples of one centimeter (cm) depth were collected within 30 m of the bridge in Charlestown. at 30 to 80 m, and at 100 m. Concentrations of lead were found to be higher nearer the bridge. The mean lead content of ten samples at the first distance was 3,272 ppm. At the greater distances the mean values were 457 ppm and 197 ppm, respectively. At the opposite end of the bridge in Chelsea, where paint removal had not occurred, the mean soil content within 30 m of the structure was 1,003 ppm. The authors state,"..blasting appears to account for a considerable portion of the 2,000 ppm difference in soil lead concentrations found between the Charlestown and Chelsea samples."

Both exposure to airborne lead and blood lead values were studied in the workers who abrasive-blasted the portions of the structure that traversed land and in those who scraped and repainted the center span. The workers on the center span had a mean of 61.2 ug/dl blood lead compared to a mean of 33.2 ug/dl for the abrasive blasters.

Blood lead levels of 47 children age one to five years old who lived within two blocks of the bridge that was abrasive-blasted were compared to those of 76 children who lived more than two blocks from the bridge. Although they were segregated by distance to the bridge, all the children lived within 300 m of the structure. Four children in the first group had blood lead levels above 30 ug/dl, whereas none of the others did, a significant difference. The highest blood lead value was 35 ug/dl. Similarly, the mean lead content of four house dust samples from within one block of the bridge was 7,580 ppm (max. 10,000 ppm) compared to five samples taken between one and three blocks of the bridge with a mean of 628 ppm. This difference too was significant. According to the authors, "The data..indicate that significantly greater absorption of lead has occurred in children living closer to the bridge than in those at greater distances. It appears likely that both automotive emissions and particulates from the abrasive blasting have contributed to the children's lead absorption, but the data do not permit definition of the precise contribution from each source." Blood lead sampling on one population of children done before and after abrasive blasting might have determined the amount of lead absorption contributed by paint removal. Such a prospective study would show the quantitative effect of lead paint removal. The initial blood lead testing, conducted before paint removal, was done with children in Chelsea and the later testing was done on children in Charlestown.

The ATSDR report of 1988 identified paint lead as the most important source of lead exposure and soil and dust lead as second in magnitude of potential exposure, affecting 5.9 to 11.7 million children annually (rf. 1). This study found that 17 percent of children in the United States between the ages of six months and five years were at risk of exposure and absorption to 15 ug/dl. As stated above, lead in soil in residential areas derives principally from exterior house paint and deposition of particles from combustion of leaded gasoline. But it can also originate in the removal of lead paint from residential, commercial, and industrial buildings and from steel structures. As discussed above (in III.B.2.), both the quantities and the concentrations of lead added to the soil from steel structures can be significant. Abrasive blasting of lead paint especially results in both lead in soil and lead in dust. In the manner that it regulates this activity, the proposed rules are needed to reduce lead concentrations in both these media of lead exposure and the attendant adverse effects on human health.

4. Environmental Effects of Lead

Lead is toxic to all species of birds and mammals that ingest either elemental lead (e.g. from secondary lead smelters), lead alkyls and derivatives (from leaded gasoline combustion), or lead paint compounds. Lead poisoning of waterfowl that ingest lead shot from wetland sediments kills 1.5 to 3 million birds each year ("Lead Poisoning in Waterfowl" brochure (undated) U.S.FWS). Food-chain effects of metallic lead in the environment have been documented in an acidic sandy soil environment at an abandoned outdoor firing range (rf. 15). Concentrations of lead in liver, kidney, and bones of mice, voles, and shrews were strongly elevated by comparison to conspecifics on adjacent property. Geometric means of lead in kidney samples of common shrews inside the range were 14.8 times greater than those outside; there was a 13.8-fold difference in femurs of bank voles between populations. The concentration of total lead in the top 5 cm of soil was 360 to 70,000 ug/g (ppm). "The observed lead contamination of both plant-feeding and carnivorous small mammal species...indicates that lead is able to enter the food chain of the ecosystem through uptake by plant roots and soil faunas."

An article in the Journal of the American Veterinary Association (rf. 10) records the death of more than 20 cows and calves in a herd of about 70 due to acute lead poisoning. Particles of lead paint generated by sandblasting a bridge with red lead paint were deposited in a pasture beneath the bridge. One of the dead cows had 351 ppm lead in the renal cortex and 1,329 ppm lead in the feces. A second cow had 31.3 ppm in the renal cortex, 12.8 ppm in the liver, and 43.7 ppm in the feces. Another cow had 1 ppm lead in the blood (~ 100 ug/dl). Samples of renal cortex of two other cows that died contained 12 and 19 ppm lead. A forage sample collected near the bridge contained 6 percent (60,000 ppm) lead. Additional forage samples collected after a one inch rainfall contained 3,300 ppm near the bridge, 1,600 ppm about 100 meters downwind from the bridge, and 200 ppm at 50 meters upwind from the bridge. Five calves that were clinically normal had 1.2 to 1.6 ppm (~ 120 to 160 ug/dl) lead concentration in blood samples collected 1 1/2 months after the initial poisonings.

Lead paint particles deposited on the soil and on vegetation pose a hazard to those animals that ingest soil and those that eat vegetation contaminated with lead particles. Soil is an important component of the intake of both domestic and wild herbivores of different species. Shorebirds and waterfowl also ingest significant amounts of soil and sediments. In one study, for example, mallard ducks had a mean soil intake that comprised 12 percent of total intake by dry weight (rf. 9).

Any vertebrate that ingests lead paint particles will absorb lead. Small paint particles produced by abrasive blasting that deposit on a lake or river can float for many hours before they become saturated. Avian or mammal species that drink from the surface of the water body can be lead poisoned. Unless they are removed, these particles will in time mix in the water and eventually deposit on the bottom sediments. Disturbance of the water surface accelerates particle sinking by breaking surface tension. There is a provision for booms in the proposed rules where lead paint is removed from bridges in order to confine this contaminant before it disperses on the water surface and is carried downstream or downwind to deposit on the shoreline. The particles must also be removed from the surface before they sink.

The effect of lead paint particles on aquatic organisms is a function of the solubility of the lead compound. Certain lead oxide and lead chromate compounds, such as would be found in bridge coatings, are amphoteric--that is, they are soluble in either high or low pH solutions. They are not readily soluble in surface water of moderate pH range. Certain species of terrestrial plants, including some garden vegetables, will absorb lead at high concentrations in soil. Aquatic plants and lower trophic-level animals that can only absorb soluble lead probably get little toxic effects in the pH range of most water bodies. Dilution by the volume of water would reduce concentrations. Lead paint particles in acidic water bodies like bog lakes (pH 4.0 to 5.0); however, can react with organic acids to form acidic compounds or they can become soluble. Peat soils in bogs have a range of pH of 4.0 to 5.1. Acid precipitation can also solubilize and transport lead into the soil or into a water body where it can remain in solution or be precipitated in small particle form, which would be available to smaller aquatic vertebrates and invertebrates. Acid rain (pH < 5.0) has been measured at all 15 monitoring sites in Minnesota, although the lowest pH precipitation is measured along the north shore of Lake Superior. pH 5 is also the acidity of the acetic acid solution used in TCLP extraction for hazardous waste determination. As reported in III.A.2.c. above, most wastes generated from abrasive blasting of lead paint on bridges, without "pretreatment" with abrasive additives, fail TCLP, as do wastes that derive from nonabrasive methods of paint removal of coatings with lower concentrations of lead.

There is a large number of lead-painted steel structures in Minnesota and a significant amount of abrasive blasting to remove both lead paint and other coatings from these structures. The magnitude of this problem can be partly measured by the knowledge of the effects of lead on human health, and the environment, and the quantities of lead paint on steel structures throughout the state. Regulation of lead paint removal is needed to control and abate the pollution that results from this practice. The proposed rules are needed to prevent dispersal of lead paint particles that would otherwise contaminate soil and water. Contamination of residential, public use, commercial, and industrial property can cause lead absorption by residents, children, and workers. Contamination of the environment can cause lead absorption by plants and animals.

IV. STATEMENT OF REASONABLENESS

The MPCA is required by Minn. Stat. ch. 14, to make an affirmative presentation of facts establishing the reasonableness of the proposed rules. Reasonableness is the opposite of arbitrariness and capriciousness. It means that there is a rational basis for the MPCA's proposed action. The reasonableness of the proposed rules is discussed below.

A. Reasonableness of the Rules as a Whole

The proposed rules are directed at preventing contamination by lead paint particles as a consequence of lead paint removal from exterior surfaces of different steel structures. They address different methods of removal, and they provide generally less stringent requirements of containment for vacuum blasting, power and hand tool, chemical stripping, and wet abrasive blasting, because these methods have less potential to cause environmental contamination. In general, the proposed rules require the owner or contractor to use minimum containment with ground cover and curtains to prevent the dispersal and the deposition of lead paint particles. Some methods of removal on certain structures require only the use of ground cover, e.g. hand tool removal on ground storage tanks. The rules also provide for the use of alternative methods of paint removal. In order not to discourage the implementation of improvements in current methods and technology, the rules provide that procedures of paint removal and containment that achieve equivalent measures of pollution control are acceptable if approved in advance by the MPCA Commissioner. As pollution control is applied to the steel structures industry, methods and technology of paint removal are replaced or supplemented by improved applications or equipment.

The proposed rules incorporate provisions to prevent lead contamination of soil and surface water, and interiors of households, child care buildings, and school buildings. Building interiors are protected by notification provisions that advise the owner of a child care facility, the administrator of a school, and adult residents of buildings, to close doors, windows, and storm windows in order to prevent infiltration of lead particulate where either dry or wet abrasive blasting is done. This notification is provided within a distance equal to the height of the structure or to 100 ft of the structure. Finally, the rules require cleanup of all visible deposits of waste material and proper removal, transport, and disposal to prevent further contamination.

Large steel structures can carry hundreds or thousands of pounds of lead paint. When these coatings are removed, the magnitude of the risk to the public health and the environment is significant, if the paint is simply transferred from the surface of the steel structure to the soil and surrounding area. This can happen with a number of methods of paint removal if containment and preventive measures are not used. By comparison with other methods of paint removal, abrasive blasting breaks the paint up into smaller particles and disperses these over a larger area.

For this reason, abrasive blasting can cause significant lead contamination. The proposed rules do not prohibit conventional dry abrasive blasting, which is customary among contractors in the state (and the entire country) who remove lead paint from steel structures. Rather, they require the use of minimum containment with abrasive blasting in all circumstances, and the use of additional containment or of alternative methods of removal under circumstances, where significant contamination is more likely or in proximity to sensitive properties. The levels of pollution control that are specified are more than has been customarily used in the past. In addition, the rules require thorough cleanup and removal of waste materials to prevent human exposure and to prevent additional contamination of the environment.

As discussed in the 'Statement of Need' above, there are compelling reasons to address the removal of lead paint from steel structures with specific regulation. The simplest regulation would be to prohibit the use of abrasive blasting of lead paint on exterior steel surfaces. This would not be reasonable, however, for a number of reasons. Abrasive blasting is the most common method of removing paint from large steel surface areas and of doing surface preparation of those surfaces. One does not remove paint from a steel surface without repainting, and one can only apply new coatings to a steel surface that is adequately prepared. Surface preparation is necessary in most cases, although the degree of preparation depends somewhat on the requirements of the new coatings. Surface preparation consists of removing existing corrosion and deteriorated coatings and producing a surface profile to "anchor" the new coatings. In some cases, abrasive blasting is the only way to achieve necessary surface preparation. Second, abrasive blasting of lead painted surfaces can be done in a way that minimizes environmental contamination, if adequate pollution control is implemented. Third, abrasive blasting (sandblasting) has been the lowest cost method to remove deteriorated coatings and prepare steel surfaces, and when supplemented with pollution control measures, it is still economically competitive. A simple ban on the use of abrasive blasting would also not be reasonable, because by itself, it would not address other methods of paint removal, which also cause contamination with lead paint particles.

An alternative means of regulating this problem would be to require maximum pollution control wherever lead paint was removed by abrasive blasting from an exterior steel surface, regardless of the amount of paint removed, the amount of lead in that paint, or the location of the alternatives regulatory schemes

structure. Total enclosure with impermeable materials and negative air, provided by dust collector machines, can achieve more than 90 percent containment efficiency of the particulates. Although this would be the most protective of public health and the environment it would be extremely costly to owners, and it would be unreasonable to require this practice in all circumstances of lead paint removal by abrasive blasting or any other method. In many circumstances, such measures of containment would achieve relatively little benefit and only at great expense.

permit

Another means of regulating this activity would be to require a permit from the MPCA before lead paint could be removed. This would not be reasonable because of the amount of time necessary to apply for a permit, modify the application, and approve a permit. Hundreds of permits would be added to the backlog of permit applications every year. Additional MPCA staff would have to be hired and trained, and there would be long delays added to the maintenance schedule of steel structures throughout Minnesota. Already every facility permitted by the Air Quality Division must be repermitted due to federal Clean Air Act Amendments. Most importantly, this process of individual permits would not provide the owners of steel structures any information about necessary pollution control that they must implement. For additional discussion of issuing air quality permits for this activity, see the discussion regarding part 7025.0220, 'Compliance,' subpart 2, 'Use of alternative methods,' below.

perf stand.

Finally, another regulatory approach would be to establish performance standards for the removal of lead paint. Compliance with such requirements would be determined by extensive sampling of the media, such as air, soil, and water. These numerical standards would also require prescribed methods to measure levels of pollution. Detailed and specific requirements for sample collection and analysis would be used in the place of work practice standards. This kind of regulation would not be as effective in addressing the problem of lead paint contamination as one that prescribed actual work practice standards, for a number of reasons. Monitoring in itself, to compare with performance standards, is not preventative. Violations that occurred would mean that unacceptable pollution had been caused, but nothing would inform the owner or contractor of how to achieve levels of compliance. A regulation based only on performance standards would be implemented on a largely experimental basis, and because of low cost incentives, it is expected that a lot of lead paint contamination would result and many violations

prescribe work practices

would be recorded. The use of monitoring is discussed further in III.A.3., 'Inadequacy of Existing Regulations' above.

In the place of a permit requirement, the proposed rules require notification of the Commissioner. and in the place of performance standards, the rules provide work practice standards or engineering controls. These elements achieve two purposes. The owner or contractor is provided with a description of acceptable methods of pollution control and the MPCA is informed of which of the methods of paint removal and containment will be implemented on the steel structure.

notice + work pract rules

The reasonableness of the rules as a whole is a function of the reasonableness of the component parts of the rules. The reader is referred to IV.B. 'Reasonableness of Individual Rules' below for a thorough treatment of the specific provisions of these rules.

Provisions of the regulation are apportioned to bridges, storage structures, and "other" steel structures--those that are neither bridges nor tanks. Parts of the rules address definitions, compliance, identification of lead in paint, notification, conditions for pollution control on individual structures, and general restrictions. The rules specify a combination of engineering controls and performance standards. These latter are found in the provisions for "windspeed limitation" and in the cleanup requirements. There are no monitoring requirements in the rules that require media sampling. The rules include a variety of engineering controls that combine different methods of paint removal with methods of containment on bridges, storage structures, and other steel structures. Storage tanks include water tanks of all kinds, fuel storage tanks, grain storage bins, and other storage structures. Steel structures are apportioned to a number of classes of pollution control. The classes of pollution control require more or less containment or alternative methods of paint removal according to the location of the structure. Simple performance standards address visible air emissions and visible deposits as well as cleanup. The combination of paint removal methods and containment with performance standards provides specific pollution control requirements. However, there are a number of different methods of removal prescribed for each class of structure, and the owner or contractor can also apply any other equivalent method subject to approval.

Standards of proximity to different receptor properties are defined by distance. Residential. child care. playground, and school properties are considered to be the most sensitive to the effects of lead contamination. Public use property, commercial property, and protected natural areas have an intermediate distance standard. Industrial and agricultural properties have the least restrictive requirements for lead paint removal. Other variables that determine the necessary class of pollution control for storage tanks are the height of the structure, the total surface area, and the concentration of lead in paint. There are four classes of pollution control for bridges and three classes for storage tanks. The requirements for pollution control for steel structures, that are neither bridges nor storage tanks, refer the owner or contractor to the provisions that address either of those two kinds of structures. Removal of lead paint from any steel structure requires the use of minimum pollution control. Generally, this consists of curtains to restrict the dispersal of lead paint particles, and ground cover to collect the deposits of waste materials.

As discussed above, this rulemaking is based in part on data collected in the field. There has been an effort made to involve the steel structures industry, including owners, consultants, and contractors, in the course of these initial investigations, and the subsequent rule review and rule writing process. Additional contacts by meetings and in correspondence apprised industry members of MPCA activity, and obtained the participation of a number of parties in providing important information. Mailings to owners, contractors, and consultants communicated both our concern for careful practices of lead paint removal, and solicited their cooperation in complying with existing recommended provisions. All parties on the various mail lists for this rulemaking have been apprised of the development of these rules, and have been provided at least one copy of the draft rules. With additional contact with MPCA staff, a significant number of these have received subsequent revisions of the draft rules. There are over 265 parties on the mail lists.

The intent of the proposed rules is the prevention of lead contamination and subsequent lead exposure and absorption. For removal of lead paint to continue on steel structures without the restrictions embodied in the proposed rule presents a significant risk of immediate and persistent exposure to lead paint particles, and serious and long-term health effects, particularly for children. These rules address a very serious environmental problem with requirements that MPCA staff believe are necessary, but also reasonable, in both their restrictions, their exemptions, and their enumeration of alternatives. The provisions of the these rules will be effective in preventing violations of existing regulations and in protecting the environment and the public health from the effects of lead contamination from paint removal from steel structures. The proposed rules will produce long-term benefit in reducing deleterious effects to the public health and to the environment.

B. Reasonableness of Individual Rules

The following discussion addresses the specific provisions of the proposed rules.

Part 7025.0200, Applicability

This part states that the subsequent parts of these rules establish the procedures that an owner or contractor shall follow to remove lead paint from the exterior surface of a steel structure that is permanently fixed in an outside location, from a mobile or portable steel structure that is located outside at the time that lead paint is removed from its surface, and from exterior metal components of buildings.

It is reasonable to state the activities to which these rules apply, so that a person will know if he or she is subject to their provisions. It is reasonable to include both owner and contractor as parties responsible for the provisions of these rules because ambiguity as to the party responsible for the testing, removal, containment, or disposal of the lead paint that is generated when steel structures are repainted, is not uncommon in the coatings maintenance industry. Every steel structure has an owner. In some cases the owner or the owner's employees will remove the lead paint. In other cases, the owner may hire a contractor to remove old paint and put on new paint, particularly where large surface areas of removal are involved, or where equipment or experience in coatings maintenance is lacking. The owner of the structure also owns the coatings on the structure. In addition, the owner can determine the specifications of the contract for removal and repainting. Contractual obligations may require that the contractor assume responsibility for pollution control that prevents contamination during removal and for final disposition of the waste materials that are generated. It is important to state that both parties are responsible for complying with the provisions of these rules, so that the owner and contractor establish respective responsibilities between them, and in particular cases where these activities are not adequately specified, it is important that either party be liable for compliance with the rules.

The steel structures that are enumerated in this part describe in general terms the kinds of structures to which the provisions for removal of lead paint from exterior surfaces in the ambient air apply. Steel structures that are permanently fixed in an outside location would include bridges, ground storage tanks, water towers, grain storage bins, pipelines, and industrial structures at industrial facilities. Steel structures that are mobile or portable, and that are located outside at the time that lead paint is removed, would include railcars, boats, and portable fuel tanks. Exterior metal components of buildings are cited here, because they do not fit either of the other categories. This would include exterior steel walls of buildings and ornamented facades or exposed structural steel. These different structures are further enumerated in the definition of "steel structure" which is treated below.

Part 7005.0210, Definitions

Subpart 1. This subpart states that the definitions set forth in this part apply to these proposed rules. It is reasonable to specifically state to which rules these definitions apply, so that persons interpreting the rules may ascertain their meaning and avoid confusion with other definitions set forth in air pollution control rules or in other federal, state, or local regulations. Although lead paint removal is not specifically regulated by other rules, some of the terms in these rules could also be found in other regulations.

It is not necessary to define every term in the rules, but to provide those definitions that enhance the understanding of the rules. Terms that are commonly used with a general meaning are defined to reduce ambiguity, and to clarify the application of the rules or parts of the rules. In addition, some definitions provide certain terms with a particular meaning in the rules. These terms are defined to specify the application of parts of the rules.

Subpart 2. "Abrasive blasting" is defined as the use of air pressure and abrasive particles to remove surface coatings, or to prepare a surface for paint application. This term is defined in order to identify a method of paint removal that is subject to the requirements of this rule. Abrasive blasting is the most common method of paint removal from steel structures, but methods of abrasive blasting can differ according to the abrasive that is used. Sandblasting uses silica sand as the abrasive, but a number of different products can be used to remove coatings and corrosion from steel surfaces in a variety of sizes, including steel grit and shot, garnet, staurolite, aluminum oxide, coal slag, and carbon dioxide and sodium bicarbonate pellets. Abrasive blasting includes both "dry" abrasive blasting and "wet" abrasive blasting, which is defined below.

Subpart 3. "Acid digestion" is defined as laboratory analysis of lead concentration according to digestion method 3050 or 3051 and analytical method 6010 or 7420 as described in EPA publication SW-846 or laboratory analysis according to ASTM method D3335 as described in ASTM publication vol. 06.01. These documents are incorporated by reference. They are available at the State Law Library through the Minitex interlibrary loan system. The definition of acid digestion is reasonable, because it describes generally accepted and uniform test methods for analysis of lead in paint and distinguishes these methods of analysis from other methods of analysis for lead. Method 3050 is a sample preparation method for soil or paint that uses heat and acid to solubilize or "digest" the sample. Method 3051 is also a thermal digestion in acid that uses microwaves as the heat source. Method 6010 is analysis by inductively coupled plasma. Method 7420 is analysis by atomic absorption (AA). Method D3335 is a hot acid extraction followed by AA spectrophotometer analysis. These extraction methods and analytical methods give results of total lead that are very similar. Other methods that may be used to test for lead in paint will not give accurate determinations of total lead concentration. It is very important that analysis that is both appropriate and accurate be conducted on representative samples of paint in order to determine the concentration of lead in the coating.

Subpart 4. "Bridge" is defined as a roadway, railway, or pedestrian bridge with steel trusses or girders that is part of a roadway, or that traverses a roadway, railway, walkway, or waterway. This term is defined, because bridges constitute a very significant number of all the steel structures in the state that bear lead paint. Bridges typically have the highest concentrations of lead in paint of all steel structures. Parts 7025.0250 to 7025.0300 of the rules address lead paint removal from bridges. It is important to specify the structures regulated by this rule, because there are bridges that do not have exterior steel surfaces such as concrete spans. Similarly, there are bridges that serve different functions whether grade separation of roadways or transportation over waterways or rail lines. They are not all a part of roadways. This definition explicitly includes steel bridges of all lengths and widths and of all functions in the state, all of which can have significant amounts of lead in paint.

Subpart 5. "Child care property" is defined as property that incorporates a child care building where children are cared for or supervised at any time of the day or year. This term is defined. because this is one of the properties to which distance from the steel structure determines the class of pollution control required for lead paint removal in both parts 7025.0250 and 7025.0310 of the rules. Because of risk of human exposure and human health effects, child care property is included in the group of receptor properties (with residential and school property and playgrounds), which is most sensitive to lead contamination, and which has the greatest distance standards. Child care property should be specifically defined so that proximity and pollution control requirements can be determined. This term is also defined in order to specify the factors of daily and seasonal use of child care activity, and to distinguish this building use from those buildings that are used as daycare facilities only.

Distance from the steel structure to the receptor properties is used to determine the class of pollution control for lead paint removal in parts 7025.0250 and 7025.0310 of the rule. Five of these properties have definitions in the rule and three do not. "Commercial," "industrial," and "agricultural" properties are not defined, because these terms are used according to their common meaning, and they are understood without interpretation.

Subpart 6. "Commissioner" is defined as the commissioner of the MPCA. This term is defined in order to distinguish this office from the commissioners of other agencies and departments in the state, to identify the individual to whom regulated parties should apply to gain approval of alternative analysis, removal, and containment methods available pursuant to part 7025.0220 of the rule, and to identify the individual to whom regulated parties should direct notices required by part 7025.0240 of this rule.

Subpart 7. "Contractor" is defined as a person, an organization, or a corporation who, for financial gain, directly performs paint removal from the exterior of a steel structure or causes such paint removal to be performed. This term is defined in order to identify the persons or entities responsible for implementing the requirements in parts of these rules. Certain obligations are shared with owners and other requirements are borne solely by the owners of the structure. The term "owner" is not defined, because it is used according to its common meaning and it is clearly understood without interpretation.

Subpart 8. "Ground storage tank" is defined as a fixed water, fuel, chemical, fertilizer, or other storage tank that has a height above the ground less than 20 ft; or a diameter greater than or equal to its height; or a length greater than its height; or a portable storage tank. This term is defined, because ground storage tanks are affected by particular pollution control provisions of the rules. This definition improves the economy of language of the rules by identifying ground storage tanks as those structures that exhibit certain important features. These provide conditions that reduce the amount of containment necessary when lead paint is removed from their surfaces.

This term is defined also, because this is one of the steel structures for which dimensions of containment during lead paint removal are specified in part 7025.0330 of the rules. Part 7025.0330 addresses lead paint removal with dry abrasive blasting from storage structures, which include both fixed ground storage tanks and portable tanks. A storage tank of any configuration that is less than 20 ft in height will include those smaller bulk fuel tanks that have diameters less than their height. However, because of their cylindrical shape and relatively large diameter-to-height ratios these structures afford less potential for lead paint particle dispersal during paint removal. Although larger cylindrical bulk fuel tanks may have a height of 50 ft, they have a diameter that is greater than the height. "Ball" tanks have a diameter equal to the height. "Bullet" tanks, commonly used for propane fuel storage, have a length greater than the height. There are reduced requirements for use of curtains for these structures in the rule, because their lengths or diameters afford a wind break effect when paint is removed from the tank walls. Portable storage tanks are included in this definition with certain fixed tanks, so that necessary pollution control requirements are known without ambiguity. Although these are the smallest storage structures, lead paint might be removed from large numbers of them at one time in one place. Including them in this definition explicitly applies the proposed rules to this activity.

Subpart 9. "High-efficiency particulate air (HEPA) filter" is defined as a filter that removes from the air at least 99.97 percent of all particles greater than 0.3 microns in diameter. It is important to define this term, because HEPA filtration is specified in a number of places in the rules. It is necessary to specify a level of filtration where air filters are required, so that adequate air cleaning is done, and so that compliance can be determined.

The definition of "power tool" in subpart 13, below, includes an electric or pneumatic tool that abrades the coating, and is equipped with a HEPA filter vacuum. In addition, where lead paint is removed from a Class III bridge with dry abrasive blasting in total enclosure with negative pressure, the dust collectors must provide HEPA filtration of exhaust air (part 7025.0290, subpart 4). Similarly, where lead paint is removed from a Class III storage tank with dry abrasive blasting within modular enclosure with negative air pressure, it is necessary to use a dust collector with HEPA filtration of exhaust air to eliminate dust emissions (part 7025.0350, subpart 3, item B).

HEPA filtration is readily available in the industrial market for both dust collectors and for vacuum equipped machines such as power tools and vacuum abrasive blasting equipment. If a filter requirement was included without qualification, paint removal might be undertaken with a "filter" that was wholly inadequate to prevent emissions to the air of large numbers of small paint particles, or with no filtration of exhaust emissions. HEPA filters are also required if vacuum recovery of waste material is done in the cleanup provision for bridges (part 7025.0270, subpart 5). However, the use of vacuums during cleanup of storage structures does not require HEPA filtration (part 7025.0330, subpart 6).

Subpart 10. "Lead paint" is defined as a coating that contains more than 0.5 percent, or 5,000 ppm, total lead by weight in the dried film as determined by acid digestion and analysis. It is necessary to define this term in order to specify the concentration of lead in a coating required to initiate the requirements for notification, pollution control, cleanup, and testing and disposal of waste material of these rules.

For industrial coatings, the concern of how much lead is in paint is most often related to the removal of a deteriorated coating. With new regulations and guidelines, the concentration of lead in paint is one of the most important factors that determine both the need for adequate containment and worker protection. It also determines the costs of these preventive measures as well as the costs of disposal of the waste that contains lead paint, or the costs of cleanup that may be incurred where pollution control is inadequate.

The definition of lead paint includes a numerical standard of concentration. This would not be necessary if all steel structures were painted with coatings known by formulation to contain a significant amount of lead. Paint that has a lot of lead in it could be called "lead paint" with little discussion of what that means. For example, the alkyd primer with lead tetraoxide that coats a large number of bridges and other steel structures throughout the United States is commonly referred to as "red lead." In one formulation this coating has a concentration of 79.87 percent lead by dry weight. However, because many coatings contain relatively low levels of lead, and because lead can be present at some level of detection in many industrial coatings, a threshold value is necessary to determine if a lead paint regulation applies to a particular paint.

A definition of lead paint should also define acceptable methods of chemical analysis used to determine a concentration of lead. For example "total" lead extraction is entirely different than TCLP analysis, although they each can determine a concentration of lead in paint. Acid digestion is defined in subpart 3 above. Also, an analysis of lead by weight of dry paint will give different numbers (usually higher) than a calculation by weight of lead "in the can." These distinctions are all important and they are included in this definition of lead paint.

There have been no federal or state standards for lead in industrial paint. The use of lead in household paint was prohibited by the Consumer Product Safety Commission in 1978. This regulation banned the addition of lead to any paint used on interior and exterior residential surfaces, toys, and furniture. Lead can only be present as a contaminant and then only at a concentration less than 0.06 percent (600 ppm). Because of this law, the view is sometimes expressed in the industrial coating field that lead paint is any paint that contains more than 0.06 percent lead. The federal regulation, however, only applies to the use of lead in house paint manufactured since 1978. It does not apply to commercial or industrial coatings, nor does it apply to paint removal. There are, however, state rules and statutes as well as local ordinances that require the abatement of deteriorated residential paint that contains more than 0.5 percent lead.

In order to establish a lead paint definition, one should address the activity under consideration as well as the pollution prevention one wants to achieve. For lead paint removal from steel structures, one could use a different standard for each method of removal according to the respective potential for contamination. It is more simple, however, to have only one standard and in order to be protective, this should address the "worst case" situation, which historically means dry abrasive blasting without containment. In addition, it would not be feasible to establish different minimum threshold values of lead in paint for the same structure according to the method of removal. Rather, these rules use only one standard for all steel structures, and prescribe different methods of removal in parts 7025.0330 to 7025.0350 for storage tanks, which can exhibit a large variation in lead concentration among individual structures.

One means to establish a numerical standard of lead concentration for paint removal is to base the standard on data of lead contamination due to paint removal activity. In other words, one can establish a definition of lead paint by using existing standards for lead. There are both federal and state standards for lead for a number of media. One would then calculate the amount of lead in paint that would result in levels of lead in the environment that are less than the applicable standard. When such a calculation is applied to steel structures, 0.5 percent lead paint concentration appears to provide an adequate measure of protection. For example, sandblasting waste deposited over 300 ft from a water tower that was sandblasted without containment was sampled and analyzed. The structure contained 10 percent total lead in the paint and the waste contained 3,750 ppm total lead. This is more than ten times the state standard for lead in soil of 300 ppm that was developed in 1991 using EPA's biokinetic model. This standard applied to bare residential and bare playground soils. If this structure had had 1.0 percent total lead in the coatings, sandblasting waste with 375 ppm lead would still exceed this soil lead standard. According to this analysis, a paint standard of 0.5 percent total lead would provide a small protection factor for so-called "worst case" situations. When one standard for lead paint is used for lead paint removal, it should be based on the method of paint removal that has the most potential to cause contamination. Where steel structures are concerned, this means dry abrasive blasting without containment.

Standards for lead in paint should be conservative, because of studies which show deleterious effects of lead absorption in children at levels previously considered "safe," and because of the lowering of definitions of lead poisoning in children and of occupational standards of blood lead and exposure to lead in the workplace (see III.B.3. above). The recommendations for lead paint removal that were mailed to all the cities and counties in Minnesota in 1990, used a standard of lead in paint of 1.0 percent. Although, that number was better than any higher standard, it is not believed now to provide adequate protection. The number 1.0 percent was selected before the latest publication of studies on the health effects of lead at low levels in the body and the persistence of those effects.

In addition, the analysis of samples of paint and abrasive blasting waste collected by MPCA staff during field investigations were not measures of "total" lead by standard EPA methods, but "extractable" lead which solubilized only 10 percent to 25 percent of the amount of lead present in the sample. This method of analysis, used by the University of Minnesota Soils Research Laboratory, under-represented the <u>total</u> concentration of lead in the abrasive waste, and soil samples reported in the field study of bridges by a large factor. It is important to remember that total lead is the appropriate parameter for public health, because of absorption of lead by ingestion in the human body. Most of the standards for lead in different media, whether concentrations in housedust, soil, water, paint, or air are based on total extractions. One exception are the standards for hazardous waste determination of heavy metals where concentrations are derived by the TCLP or "leach" test.

It would be difficult to put forward adequate reasons for a standard of 1 percent total lead or anything higher than 0.5 percent. If 0.5 percent lead concentration is defined in existing regulations that address the removal of deteriorated household paint or abrasive blasting of exterior paint on residential, child care, and school buildings, then an equivalent standard is appropriate for steel structures. An elevated water tank in a residential community with elementary school and daycare centers in proximity to the structure should not be sandblasted without pollution control if it has more than 0.5 percent total lead in the coatings. Many of these water towers have houses directly beneath them on one or more sides. Even those that are not immediately surrounded by buildings often have houses or public use areas or playgrounds well inside the radius of dispersal of lead paint particles. This distance is greatest with dry abrasive blasting, but because of their height and the effects of wind at this height, other methods of removal can also cause widespread contamination with lead paint particles. Where only one standard is used for lead paint, it is appropriate to consider such "worst cases" which are not, in fact, unlikely events. Water towers regularly present "bad" situations, because of significant concentration of lead in paint, and because of proximity of sensitive receptor properties. It would be inappropriate to use other examples, such as "average" events, where the public health is not so evidently put at risk. A further discussion of the definition of lead paint is found in the April 1993 issue of the J Prot Coatings & Linings (rf. 8).

The effect of the standard of lead paint in these rules is to require some pollution control when paint containing more than this concentration is removed from the exterior steel surface. Structures with less lead in paint are exempt from the proposed rules. It is important to point out that the rules require different methods of removal, and different methods of containment for storage tanks (water towers, fuel storage tanks, grain storage bins, etc.) in part 7025.0310, according to variables that include the concentration of lead in paint as well as the designated use of properties in the vicinity of the structure. The standard of 0.5 percent does not require maximum containment efficiency on every steel structure that exceeds this value.

EPA is required to regulate this activity under Title X of the Housing and Community Development Act of 1992 (PL 102-550). As stated above (in III.A.2.d.), Title X is the "Residential Lead-Based Paint Hazard Reduction Act of 1992." Removal of lead paint from steel structures is addressed under sec. 1021, wherein the Toxic Substances Control Act is amended by the addition of Title IV. Removal of lead paint from target housing, public and commercial buildings, and a "..bridge, or other structure or super-structure..." is regulated by sec. 402 (b) where "lead-based paint activities" are defined. In this legislation, the standard of lead paint is 0.5 percent total lead by weight.

Lastly, only a small proportion of storage tanks have more than 0.5 percent, but less than 1.0 percent lead in paint (see III.B.2.a). Other steel structures, such as bridges, that have lead paint on them have much more than 1.0 percent lead in paint. In most cases, the difference in practical application between these two standards is a difference without an effect. However, for certain structures the standard of 0.5 percent will make a difference between pollution control, and no pollution control, and that difference will be very important.

The numerical value of this standard for lead in exterior paint is reasonable, because it is considered to be low enough to protect public health and the environment, but not so low as to incur expense that is unnecessary to achieve this purpose. This standard is considered to be both necessary and sufficient, whereas the use of analytical detection limits, for example, or the present federal standard for lead in house paint of 0.06 percent would be unreasonable. In addition, this standard conforms to standards for lead in paint found in local ordinances, and to the standards in the residential lead paint abatement rules enacted by the MDH in 1991. A standard of 0.5 percent total lead was also applied in the Rules Governing Abrasive Blasting of Lead Paint on Residential, Child Care, and School Buildings, Minn. Rules pts. 7005.6010 to 7005.6080 (renumbered 7025.6010 to 7025.6080) promulgated in September 1991. These standards are also found in state rules and local ordinances around the United States.

It is also important, however, to bear in mind that regulations or guidelines establish only minimum requirements. Even where regulations do exist, more restrictive standards of lead in paint can be used than are legally necessary. Certain municipalities, for example, may require "total containment" of a water tower during maintenance repainting due to concern of neighboring residents or to prevent complaints due to dust emissions, even though the tank may have very little lead in the paint. This has happened in Minnesota where the exterior coatings contained less than 0.5 percent total lead.

Subpart 11. "Low-dust nonsilica abrasive" is defined as an abrasive particle product that is rated by the manufacturer as a low-dust abrasive, and that contains less than one percent free silica by weight. This phrase is defined because such an abrasive is required in part 7025.0260, if abrasive blasting for surface preparation is done without containment on steel members of a bridge after lead paint removal, and similarly, in part 7025.0320 for surface preparation after removal of lead paint on storage structures with either power tools or hand tools or chemical stripping.

Low-dust nonsilica abrasives that would be used to prepare steel surfaces for new coating application include staurolite mineral abrasives, coal and copper slags, steel grit, garnet, and "manufactured" abrasives such as aluminum oxide and silicon carbide. The criterion of low-dust is included because of particulate emissions and fugitive dust. This problem would result from the use of friable abrasive products without vertical containment. The nonsilica requirement is included, because of the potential public health effects of respirable silica dust that would be caused by the use of silica abrasive (most commonly silica sand) without containment (see III.A.2.a.). The nonsilica abrasives are typically "low-dust" abrasives by comparison to silica sand. For this reason, manufacturers claims are acceptable rather than a numerical standard derived from abrasive blasting testing or listing on the CARB list of certified abrasives. Because of OSHA labeling requirements, abrasives that contain more than 1 percent free (or crystalline) silica by weight would be readily identified.

Subpart 12. "Playground" is defined as an area designated for children's play including a school playground, a child care building playground, a play area of a public park, or an area that contains permanent play equipment. This term is defined, because this is one of the properties to which distance from the steel structure determines the class of pollution control for lead paint removal in both parts 7025.0250 and 7025.0310 of the rule. Because of risk of human exposure and human health effects, playgrounds are included in the group of receptor properties (with residential, child care, and school property), which is most sensitive to lead contamination, and which has the greatest distance standards. Playgrounds should be specifically defined so that proximity and pollution control requirements can be determined where lead paint is removed.

Subpart 13. "Power tool" is defined as an electric or pneumatic rotary peening tool, needle gun, or other tool that breaks and removes a coating, but does not abrade the coating, or an electric or pneumatic tool that does abrade the coating, and is equipped with a HEPA filter vacuum. This term is defined, because use of power tools is one of the methods used to remove lead paint. Power tools can include both electric or pneumatic tools with a variety of applications for paint removal. Defined in this manner, sanding tools or tools that abrade the coating that are equipped with HEPA filtration can be used in the same manner as power tools that do not abrade the surface that are not so equipped. This definition improves the economy of language of the rule. The problem with power tools like rotary sanders is that they produce small particles of lead paint that are difficult to contain or capture, and that would require additional pollution control. The term "hand tool" is not defined, because it is used according to its common meaning and it is clearly understood without interpretation.

Subpart 14. "Protected natural area" is defined as a designated national park, national wildlife refuge, nature center, or environmental learning center; an area designated by the MnDNR as a wildlife management area, scientific and natural area, state park, research natural area, waterfowl production area, or area of special interest; a site officially registered with any unit of government through the Scientific and Natural Area program of the MnDNR; or a site of occurrence of unique plant or animal life identified by the Natural Heritage Program of MnDNR.

This term is defined, because this is one of the properties to which distance from the steel structure determines the class of pollution control for lead paint removal in both parts 7025.0250 and 7025.0310 of the rule. Because of environmental or non-human health effects, protected natural areas are included in the group of receptor properties (with public use and commercial property), which has intermediate sensitivity to lead contamination and an intermediate standard of distance. These areas should be specifically defined so that proximity and pollution control requirements can be determined where lead paint is removed.

Subpart 15. "Public use property" is defined as property that includes a publicly owned building, a recreational area, or a parking lot, but does not mean property that includes only a playground or only a roadway.

This term is defined. because this is one of the properties to which distance from the steel structure determines the class of pollution control for lead paint removal in both parts 7025.0250 and 7025.0310 of the rule. Because of human health effects, public use property is included in the group of receptor properties (with protected natural areas and commercial property), which has intermediate sensitivity to lead contamination and an intermediate standard of distance. These areas should be specifically defined so that proximity and pollution control requirements can be determined where lead paint is removed.

Public use property is excluded from this definition if it includes only a playground or only a roadway. Playgrounds are defined separately and have more restrictive protection standards than other public use areas, because they are used primarily by young children. Roadways are not deemed to be sensitive receptors, because unlike parking lots, they are not generally used in a manner by which people could experience exposure to lead paint particles. Motor vehicles that are in motion would protect the occupants from any significant contamination, in most cases. Parking lots, on the other hand, deserve additional protection, because significant amounts of paint particles could deposit on the exterior surfaces of stationary vehicles, and if windows were left open, could contaminate the interior compartments of the vehicles. In addition, people who go to and from their vehicles could walk in lead contaminated deposits and could get dust on their clothing. Both of these means could contaminate the passenger area of the vehicle, and also the household interior by transport on shoes and clothes. Inhalation of particles into the nose or mouth would provide a direct means of lead exposure to users of a parking lot who walked through emissions of lead paint particles.

Subpart 16. "Residential property" is defined as property that incorporates a single-family or multiunit building that is intended for use for human habitation. This term is defined, because this is one of the properties to which distance from the steel structure determines the class of pollution control for lead paint removal in both parts 7025.0250 and 7025.0310 of the rule. Because of human health effects, residential properties are included in the group of receptor properties (with child care and school property and playgrounds), which is most sensitive to lead contamination, and which has the greatest standard of distance. This class of property should be specifically defined so that proximity and pollution control requirements can be determined where lead paint is removed.

Subpart 17. "School property" is defined as property that contains a public school building as defined in Minn. Stat. § 120.05, or a nonpublic school, church, or religious organization building in which a child is provided instruction in compliance with Minn. Stat. §§ 120.101 and 120.102. This term is defined because this is one of the properties to which distance from the steel structure determines the class of pollution control for lead paint removal in both parts 7025.0250 and 7025.0310 of the rule. Because of human health effects, school property is included in the group of receptor properties (with residential and child care property and playgrounds) which is most sensitive to lead contamination and which has the greatest standard of distance. This property should be specifically defined so that proximity and pollution control requirements can be determined where lead paint is removed.

Subpart 18. "Steel structure" is defined as a structure that has a steel surface from which lead paint might be removed in the ambient air and includes, as items A through Q, steel girders or trusses of a bridge, water storage tanks; fuel and chemical storage tanks; fertilizer tanks; grain storage bins; railcars; buildings; pipelines; boats and barges; transmission towers; transformers; light poles; parking ramps; handrails; vehicles that are used for commerce, or industry, or construction; and steel structures of utilities, power plants, water and waste treatment facilities, pulp and paper mills, chemical and food processing plants, petroleum refining plants, shipyards, and other industrial and commercial equipment.

It is reasonable to provide a specific definition of steel structures in order to inform owners of these structures, and contractors who remove lead paint from their surfaces, of the subject of these rules. The different steel structures that are cited here can bear significant amounts of lead paint on relatively large exterior surface areas or they can be located in sensitive areas. Certain structures, particularly water towers and commercial building exteriors can be sited in areas of receptor properties that are especially sensitive to contamination with lead paint particles. Other structures like bridges can have very high concentrations of lead in paint on very large surface areas.

In the text of the rule, provisions related to bridges are found in parts 7025.0230 to 7025.0300, and 7025.0380. Provisions related to water tanks; fuel, chemical, and fertilizer tanks; grain storage bins; and other storage structures are found in parts 7025.0230, 7025.0240, 7025.0310 to 7025.0350, and 7025.0380. Provisions related to steel structures, that are not bridges or storage tanks, are found in parts 7025.0230, 7025.0240, 7025.0360 to 7025.0380. Except for exterior steel surfaces of buildings, which may be commercial buildings, and certain vehicles, this list includes primarily industrial structures and "other industrial and commercial equipment." It does not include other private property, such as auto bodies, clothesline poles, or home or farm implements. Vehicles that are used for commerce, industry, or construction are included with certain conditions in part 7025.0360.

Subpart 19. "Vacuum blasting" is defined as dry abrasive blasting with a blast nozzle that is surrounded by a chamber under negative air pressure that is held against the coated surface. This term is defined in order to specify a method of paint removal that may be used in parts 7025.0290 and 7025.0300 for bridges; and in part 7025.0350 for storage tanks; and in part 7025.0370 for other steel structures; and to distinguish this method of abrasive blasting from other methods of paint removal.

Subpart 20. "Water tank" is defined as a ground storage tank, a standpipe, or a water tower that is used as a reservoir of water. This term is defined to improve the clarity of the language of the rule by identifying "water tanks" as those various structures used to store water and including with these ground storage tanks and water towers. Ground storage tanks that hold water and water towers are also water tanks. "Ground storage tank" is defined separately by its size or configuration (subpart 8 above). "Water tower" is defined separately as an elevated water tank (subpart 21 below). Part 7025.0230 of the rule addresses testing different kinds of water tanks for lead paint and parts 7025.0320 to 7025.0350 address lead paint removal from storage tanks, including water tanks.

Subpart 21. "Water tower" is defined as an elevated multileg tank, a pedestal column spherical tank, or a fluted column tank or hydropillar used as a reservoir of water. This term is defined because this is one of the steel structures for which dimensions of containment during lead paint removal are specified in part 7025.0330 of the rule. In addition, part 7025.0230 of the rule addresses testing different water towers for lead paint and parts 7025.0320 to 7025.0350 address lead paint removal from storage tanks, including water towers.

Subpart 22. "Wet abrasive blasting" is defined as abrasive blasting with the addition of water to the air abrasive stream. It is reasonable to define this term to specify a method of paint removal that may be used in parts 7025.0290 to 7025.0300 for bridges; and in parts 7025.0330 and 7025.0350 for storage tanks: and in part 7025.0370 for other steel structures; and to distinguish this method of abrasive blasting from other methods of paint removal. Wet abrasive blasting in this definition encompasses a number of different methods of abrasive blasting that use both water and an abrasive. These are referred to by different terms in the industry and include the addition of water, under pressure or not, to the air-pressure and abrasive mix, or the addition of abrasive to water under pressure. However it is done, all methods use both water and abrasive. In this definition the water is added to the high pressure air and abrasive stream. This is so worded to prevent the use of large volumes of water. The use of water alone without abrasive is termed "water blasting" or "hydroblasting." In this rule, water blasting refers to the use of high pressure water with or without abrasive. This method is treated under part 7025.0380, Restrictions. The use of high pressure water requires a much larger volume of water than high pressure air and large volumes of water are very difficult and costly to contain.

Part 7025.0220, Compliance

Subpart 1. This subpart states that an owner or a contractor who removes lead paint from a steel bridge; from a steel water tank, ground storage tank, grain storage bin, or other storage structure; or from another steel structure shall comply with the parts of the rule cited in items A, B, or C respectively of this subpart. The parts of the rule that pertain to these different activities are enumerated here at the beginning of the provisions of the rule so that the owner or contractor can readily identify those provisions that apply to his or her activities.

Subpart 2. This subpart states that the owner or contractor may use methods of paint analysis, paint removal, and containment other than those specified in this part if the commissioner approves the alternative method in writing prior to its use. It is reasonable to require the owner or contractor to use those methods which are cited in the rule whose feasibility has been demonstrated or established. It would be unreasonable, however, to require the owner or contractor to continue to use present methods if new test methods or new technologies of paint removal and pollution control are developed. In recent years there have been numerous developments by manufacturers and end-users alike in methods of lead paint removal as the problems of lead paint contamination due to maintenance of steel structures have become more widely known. Development and application of new methods or technology or new applications of old technology will continue in this industry due to increasing concern about lead in the environment and due to federal, state, and local regulation. Those applications that achieve the desired effect of pollution prevention should not be prevented by this rule, nor should this rule be an impediment to the development, implementation, and evaluation of the efficacy of such applications. This provision is also reasonable because certain unique circumstances may prevent the use of the methods prescribed in the rule on a particular structure or on a part of a structure and alternatives may need to be implemented for such situations. It is reasonable that departures from the methods set forth in the rule be justified by the owner or contractor who requests the departure.

This subpart further states that the commissioner shall give conditional approval of the alternative method if the owner or contractor demonstrates that the method provides analysis of equivalent accuracy or pollution control of equivalent or greater efficiency than the methods specified in this part. This can be done by submitting a request in writing that provides product specifications and either original documentation or manufacturer data for evaluation. In addition, the request must identify the specific provisions of the rule for which substitution with the alternative method is requested. Pollution control can be achieved by either methods of paint removal or methods of containment or combinations of these. It is reasonable to require that information be provided that describes the particular product and also documents the effect of using the product. Original documentation would include data or evidence collected by the owner or contractor or someone else who had used the product. This use may have occurred in Minnesota before the rules were promulgated, or it may have been used to remove or contain lead paint removal in another state, or non-lead paint in Minnesota. It is reasonable that these methods be approved if they meet or exceed existing practices.

These rules do not require a permit for removal of lead paint. Instead work practice standards are established in the provisions of the rules themselves and a notification procedure to the MPCA is prescribed in part 7025.0240. Permit application and review would add unnecessary costs and delays to the coating maintenance industry in the state and to the innumerable owners of steel structures, both public and private, throughout Minnesota. In addition, there is a great number of steel structures from which lead paint is removed each year and it would not be possible for the MPCA to do timely review of permit applications for this activity because of lack of staff. The Air Quality Division permit program now has a large backlog of permits to review from both new and existing sources. There are about 1,000 existing facilities in the state that require new or renewal permits for air quality due to the Clean Air Act Amendments of 1990. Permitting lead paint removal from steel structures could add hundreds of permit applications per year, each of which would require careful review and/or further investigation for additional information.

In the place of a permit requirement, this provision of the rules provides that an owner or contractor can request approval to use a method not specified in the rules. This is similar to a variance procedure. It is reasonable to require that such methods be approved prior to use so that methods that are not equivalent in effect or are otherwise inadequate to prevent contamination of the environment are not employed. The concentrations of lead are so great in so many of these coatings, and the potential for contamination is so significant, that it would not be reasonable to allow the use of "equivalent" methods without first demonstrating their efficacy. The safeguard provided by MPCA staff evaluation of alternative methods prior to their use is therefore a reasonable requirement of the rule. The phrase "conditional approval" means that if the alternative method is found to be equivalent, it may be approved with conditions. For example, it may be deter-mined that a particular method of removal may protect the environment only if it is associated with a particular kind of containment, or vice versa. Or, only a relatively small structure or a portion of a large structure may be approved for application of the alternative method of pollution control on a demonstration or experimental basis.

There is a deliberate effort in the language of this rule to provide flexibility to owners and contractors when lead paint is removed, consistent with good practices of pollution control. This is evident in both the number of containment alternatives and the number of paint removal methods that are provided in the rule. This subpart, which allows for the use of alternative methods, provides additional latitude to owners and contractors and it applies to the basic aspects of lead paint removal. This is done for two reasons. As stated above, it would be a mistake to "lock in" methods in a rule which regulates an activity that is sure to undergo many changes due to both regulation and competition. Although these methods may be the best available for the present day, significant effort would be required to revise the rule to accommodate every new method that is developed. In effect this could mean that a rule would "degenerate" as conditions change over time, from provisions that effect substantial pollution prevention to those that actually prescribe what may become unacceptable levels of contamination. Both the provision for the use of alternative methods and the number of options available in different parts of the rule will extend the "longevity" or the useful application of this rule which is largely based on engineering controls.

Secondly, the significant costs of pollution control where large amounts of lead paint are removed provide an incentive to improve efficiency of pollution control and productivity of paint removal and surface preparation. The rule describes acceptable existing methods, but it also anticipates applications of new technology or new applications of old technology that either improve pollution control or achieve equivalent results at lower cost. This same principle was cited in "contract conditions" of the "Recommendations for Pollution Control of Abrasive Blasting of Lead-Painted Water Towers" that has been distributed to all the cities in Minnesota and to many contractors, consultants, and owners since March 1990 (exh. 6).

Subpart 3. This subpart states that nothing in parts 7025.0200 through 7025.0380 shall be construed to allow testing, removal, containment, recovery, or disposal of lead paint or lead paint particles from steel structures in violation of local regulations or federal and state rules and statutes, including those relating to occupational safety and health, which include 29 CFR 1926.62, as adopted by reference in Minn. Rule pt. 5205.0010.

It is because this activity is largely unregulated for environmental protection that this rule is proposed. Although there are no existing regulations that specifically prescribe methods of lead paint removal or pollution control during lead paint removal, there are regulations such as air quality standards and hazardous and solid waste rules that relate to some aspect of this activity. In particular, regulations that protect worker safety and health are especially important where lead paint is removed, particularly when abrasive blasting is used. Compliance with such regulations is even more important where containment is used to prevent environmental contamination and risk to the public health. By preventing the dispersal and dilution of lead paint particles in the ambient air, the concentrations of this toxic material inside enclosures greatly increases. There are standards of lead concentrations in air in the workplace in both OSHA regulations and in NIOSH guidelines. These standards are exceeded many fold on bridge maintenance projects where lead paint is removed in total containment without adequate ventilation and replacement of the air. Positive pressure respirators are minimum protective equipment for the worker who abrasive blasts lead paint. Inside containment, respirators that are properly fit and that meet specifications of air flow are essential. Lead poisoning in sandblasters has been documented on different projects in this country where measures were inadequate to keep the concentrations of lead in the air within the protection limits of the respiratory equipment.

In August 1991, NIOSH issued a new guideline for lead exposure in the construction industry. At that time, NIOSH's recommended exposure level (REL) was less than 100 ug of lead per cubic meter of air (ug/m^3). "Preventing Lead Poisoning in Construction Workers" reported 42 cases of lead poisoning among construction workers who either repainted or demolished lead painted bridges at eight different sites. This document recommended that airborne lead levels not exceed 50 ug/m^3. This publication was issued again in a revised edition in April 1992. On May 4, 1993, federal OSHA adopted a new standard for lead exposure in the construction industry (29 CFR 1926.62). The general industry standard of lead in the workplace of 50 ug/m^3 was applied to the construction industry. Until then, lead paint removal activities were regulated by a worker protection standard of 200 ug/m^3. This new standard of 50 ug/m^3 is part of the new federal requirements to protect workers from lead exposure in construction industries, which includes maintenance repainting of steel structures.

Because of the real hazard to workers engaged in lead paint removal activity, the phrase "..including those relating to occupational safety and health" is explicitly stated in the proposed rule as well as the reference to 29 CFR 1926.62. This refers to title 29, Labor of Code of Federal Regulations, part 1926, and section 62. Part 1926 addresses safety and health regulations for construction. Section 1926.62, called "Lead," was added to subpart D, Occupational Health and Environmental Controls. Minnesota OSHA adopted 29 CFR 1926.62 by reference on October 11, 1993 (18 SR 1065) under Minn. Rule pt. 5205.0010.

The provisions of this rule are directed at protecting the environment. It is reasonable then that the rule does not include explicit language that prescribes measures that are exclusively intended for worker protection. The MPCA is precluded in its rulemaking authority from promulgating rules for the purpose of worker protection. Specific ventilation rates inside the containment or different respiratory protection equipment are not found in the rule. Nor are there air monitoring requirements by personal air samplers. However, these regulations and others do apply to lead paint removal activity and it is reasonable to clearly state this fact in part 7025.0220, Compliance, so that the regulated parties are cognizant of these requirements so that they take preventive measures to protect the health of the workers.

The application to this rule of other air quality rules that regulate fugitive dust and visible emissions is discussed further in parts 7025.0260 and 7025.0320 where abrasive blasting may be necessary where lead paint has been removed by a method that does not do adequate surface preparation for new coatings.

Part 7025.0230, Identification of lead in paint

Subpart 1. This subpart states that an owner shall test a coating for total lead concentration before the owner or contractor removes the coating from the exterior of a steel structure, except as provided in subpart 2, items A and C, unless removal is to be conducted inside a building. It is reasonable to require testing of paint for lead concentration before the paint is removed because it is most important that the constituents of the coating be first identified. For many years lead paint has been removed in Minnesota without any testing of the paint and without any pollution control. This has caused very serious lead contamination over large areas. It is reasonable that the owner be required to test the paint, although either the owner or contractor may remove it, because the owner of the steel also owns the coatings on the surface of the steel. In addition, it is important that one party be responsible for the initial determination of lead concentration in paint so that ambiguity in the rule does not allow either intentional non-testing or miscommunication between owner and contractor.

It is in the best interest of owners to have an accurate determination of the average concentration of lead in the coatings on the steel structure and it is necessary to determine if this amount meets the definition of lead paint in the rule. Without the knowledge of test results, the applicability of the rule cannot be determined. That means enforcement action could not be taken until this testing was completed, and worse, that lead paint might be removed without any pollution control because of a false assumption that the coating was not lead paint. It is not adequate to allow the owner or contractor to waive the testing requirement and consider the paint to be lead paint because a violation of any part of the rule could not be prosecuted until this determination was made. This has been an ongoing problem with the rules that restrict abrasive blasting of lead paint on residential, child care, and school buildings, promulgated in September

1991. In addition, the concentration of lead in paint is an important factor that determines potential lead contamination. This concentration is used in the calculation in part 7025.0310, Classification of storage structures, that determines the required class of pollution control in parts 7025.0330 to 7025.0350 for different classes of storage structures.

It is reasonable that testing is not required where paint removal is to be conducted inside a building because this circumstance would have a relatively small effect on the ambient air. This condition would apply to mobile steel structures such as railcars which could be moved into buildings for maintenance repainting. In addition, in-shop blasting operations can be used to remove lead paint from steel structures that are disassembled or from smaller pieces that are left whole. Shop blasting by different methods is, by definition, done inside a building. This same exemption would apply to other methods of paint removal that were conducted inside a building. Air quality rules promulgated by the MPCA are directed at environmental protection and the ambient air. To conduct lead paint removal inside a building would, in general, achieve the purpose of the rule without requiring additional containment. Air quality permits may be required where open abrasive blasting was conducted inside a building and the air was exhausted to the outside. Presently, such a permit is required if the "potential-to-emit" of all combined emissions, including paint solvents, exceeds 25 tons per year. It is important to bear in mind that regulations or guidelines establish only minimum requirements. Owners or contractors may, for reasons of occupational health or waste disposal regulations, choose to analyze coatings for lead content even where removal is conducted inside a building.

Subpart 2. This subpart states that the samples collected shall be representative of the coatings to be removed. Specifically, it states that each sample shall include equal surface areas and the entire thickness of each coating and that, if parts of the steel structure have been painted at different times or with different paints, then a sample of each coating from each of these parts must also be collected. The sampling procedure for different steel structures is treated in items A, B, and C of this subpart. It is not unusual to find significant variation in total lead concentration in samples of apparently identical paint that has been removed from the same structure. It is necessary that paint samples be analyzed before paint removal, but it is very important that these samples be representative. It is reasonable that the basic characteristics of representative sampling of coatings on exterior steel be specifically stated so that the regulated parties understand this concept.

The samples must represent the coatings to be removed. If only a portion of the steel structure will be repainted, only those parts from which existing paint will be removed should be tested. Likewise, if the topcoat only will be removed, the topcoat paint only should be tested. If primer is only to be removed in areas of corrosion, then the primer must be tested as part of the calculation of mean lead concentration in subpart 3.

If lead is present in the different layers of paint on a steel structure, in most cases the primer paint will have more lead content than midcoats or topcoats. Because of these differences in lead concentration, it is essential, if all the coating will be removed, that a sample of the coating include all the layers of paint on the surface and that it include equal surface areas of each layer. It is important too that the entire thickness of each layer be included in the sample. If the owner, in collecting paint from a surface for lead testing, scrapes a larger amount of topcoat paint and a lesser amount of primer paint from the sample area, the sample will not represent the paint that will be removed. This is a very common problem in sampling. As one example, one city sampled two different water tanks for total lead content in the exterior paint. The first tests indicated 0.9 percent and 0.95 percent lead. When the paint was sampled again to ensure equal surface areas of each coating in the sample, the test results were 4.5 percent and 5.5 percent total lead, respectively. Similarly, if the entire thickness of primer paint is not removed from the steel surface during sampling, the sample will not represent the paint that will be removed. Abrasive blasting is usually used to remove all coatings and abrade the bare surface of steel structures.

The problem of sampling paint on steel that has been repainted in parts poses special conditions for representative sampling. If all of these coatings will be removed, they must each be sampled and analyzed for the calculation of mean lead concentration in subpart 3.

Item A. This item states that prior to paint removal, the owner of a bridge shall determine the concentration of lead in paint on the bridge either by review of painting records or by acid digestion analysis of a minimum of one sample of paint from a girder bridge or one sample of paint from the trusses and one from the girders of a truss bridge. Most bridges that have not been painted or repainted in the last ten years have significant amounts of lead in the primer paint and sometimes in the midcoat and topcoats as well. These primers are often a red lead formulation and sometimes a lead silico-chromate. Most bridges in the state are owned by counties, townships, or the state. This has two effects where coatings are concerned. Larger jurisdictions that own and maintain a large number of bridges in many cases used a small number of coating systems on these structures. In addition, both MnDOT and the counties have written records available of the coatings that are on the bridges. For these reasons it is reasonable to allow the use of painting records to determine the concentration of lead in paint on bridges.

Where paint history documents cannot be located or are unreliable, it is reasonable to require laboratory analysis of a minimum of one or two samples of paint. Girders or beams would in most cases have the same coating, whereas a truss bridge that has both girders and trusses may more often have different coatings on different parts. This is because of different levels of corrosion that may occur above and below the bridge deck that would necessitate maintenance repainting on a part of the bridge instead of the total structure. In addition, such spot or partial repairs are more likely to be required on structures with large amounts of steel which is a general characteristic of truss bridges compared to girder bridges.

Item B. This item states that prior to paint removal, the owner of a water tank, ground storage tank, or grain storage bin shall determine the concentration of lead in paint on the structure by acid digestion analysis of each sample of paint. The sampling of these different storage tanks is differentiated by the minimum number and location of samples in subitems.

Unlike bridges, storage tanks have been painted with a great variety of coatings that exhibit a wide range of concentrations of lead in paint (see III.B.2.a. and b.). In addition, in many cases the owner of the tank does not have good paint history documents or these records do not indicate the amount of lead in the coating that was applied to the structure. This is partly due to the large number of industrial paints used on tanks by contractors in the past. In a number of cases, the records located by a municipality have not correctly identified the paint on the water tower. In the case of municipal water towers, it is most important that false assumptions of little or no lead in the paint not be made because of the serious risks to the public health. For these reasons, it is important that determinations of lead concentrations on storage tanks be made by actual analysis of paint samples.

Subitem 1. This subitem states that the owner of a multileg water tank shall collect, at a minimum, one paint sample from the legs, one sample from the center column, and one sample from the reservoir, for a total of three samples. Multileg elevated tanks have more structural components and more surface area per volume than other elevated tanks. They may have from four to twelve legs in addition to the center column and the reservoir. These different components are often repainted at different times because they experience different rates of corrosion or because of graffiti or other vandalism to the lower parts of the structure. If these new coatings contain a different concentration of lead than the original paint, then a single sample will not represent the concentration of lead on the whole structure. Although testing parts of the structure that have been painted at different times or with different paints is required in the beginning of subpart 2, above, it is not always known when and where this has occurred. Usually, unless the same primer and topcoat were used for repainting, a single sample collected from a surface that was repainted will underrepresent the amount of lead on the entire water tower because of the general reduction of lead content in paints over time by manufacturers.

Subitem 2. This subitem states that the owner of a water tower that is not a multileg water tank shall collect, at a minimum, one paint sample from the base of the column and one sample from the top of the column or the reservoir, for a total of two samples. These towers include single column pedestal and fluted column tanks or hydropillars. Because these tanks have fewer structural components and relatively smaller surface area per volume, it is reasonable to require a minimum of only two samples of paint from different areas of the structure, rather than three samples.

Subitem 3. This subitem states that the owner of a ground storage tank, standpipe, and grain storage bin shall collect, at a minimum, one paint sample from the wall and one sample from the roof of a ground storage tank where the same paint will be removed from one or more identical tanks, and for standpipes and grain storage bins, one sample from the bottom half and one from the top half of the wall for a total of two samples. Fuel storage tanks at bulk storage facilities or at terminals are often part of a "tank farm." These structures were usually constructed and painted at the same time and in many cases, they are repainted at the same time. Because they would have the same coating, it is reasonable to allow only one of the ground storage tanks to be sampled when "the same paint will be removed from one or more identical tanks." In this case, requiring that each individual tank be sampled would add additional expense without adding any useful information. If these tanks were not painted with the same paint, then paint samples would have to be collected that represent the different paints.

Standpipes, used to store water, and grain storage bins have a similar configuration. Because of their size, it is reasonable to require a minimum of two paint samples to provide better representation of the coating to be removed. Most of the surface area of these structures is a cylinder wall. It is reasonable that the samples be collected from different parts of the wall. Again, the base of these structures is subject to more repainting because of damage inflicted by people and because of the ease of repainting this area.

Subitem 4. This subitem states that the owner of small storage tanks shall collect, at a minimum, one paint sample from a fixed storage tank with less than 1000 square ft surface area and one paint sample from a portable storage tank where the same paint will be removed from one or more identical tanks. It is reasonable to require that only one paint sample be taken from relatively small fixed storage tanks. This surface area would include a large number of privately owned gas and fertilizer tanks of any configuration. Similarly, portable tanks are small by definition and a single sample would adequately represent the coating to be removed. As with ground storage tanks, it would be unreasonable to require that each portable tank, such as propane cylinders, be sampled where "the same paint will be removed from one or more identical tanks."

Item C. This item states that prior to paint removal, the owner of a steel structure, other than a bridge or storage tank, shall determine the concentration of lead in paint on the structure either by review of painting records or by acid digestion analysis of a minimum of one sample of paint. These other steel structures include railcars, pipelines, structures found at industrial facilities, and other industrial equipment. Owners of these structures will, in many cases, have accurate documents regarding these coatings, especially where maintenance repainting has been completed "in-house" and not by outside contract. It is reasonable to allow the use of paint records or the analysis of one sample of paint for these structures, most of which will be smaller in surface area than bridges or storage tanks. Storage tanks at these facilities would be sampled as required in item B above.

Subpart 3. This subpart states that where samples are analyzed from different parts of one structure, the calculation of lead concentration for the structure is the sum of the following product for each of the paint samples:

surface area of part represented by sample as a percent of total surface area of structure x Pb concentration of sample (%)

such that:

$$(\text{area}_A \times \text{Pb}_A) + (\text{area}_B \times \text{Pb}_B) + \ldots + (\text{area}_N \times \text{Pb}_N) = \text{lead concentration (\%)}$$

where "A," "B," "N" are sample areas; "area" is the surface area of the part of the structure expressed in whole percent of total surface area, so that the sum of all surface areas is equal to 100 percent; and "Pb" is the concentration of total lead expressed in percent as a decimal.

It is necessary to determine a concentration of lead in paint for a steel structure in order to determine if the coating meets the definition of lead paint in the rule and to implement the requirements for pollution control which, for storage tanks, vary with the concentration of lead in the paint and other factors. Rather than require different methods of containment on different parts of the structure according to the existing lead concentration on that part, one average concentration is used for the whole structure. This subpart provides a means to calculate this lead concentration. It would be too cumbersome to require different restrictions on lead paint removal from different surface areas in the rule. An owner who prepared contract specifications for such a removal may achieve some cost savings; however, and could submit this alternative for approval under 7025.0220, Compliance, above.

The application of this calculation can be illustrated by an example for a multileg water tank from subpart 2 above. As required by item B, a minimum of three samples, collected one from the legs, one from the center column, and one from the reservoir would be analyzed for total lead concentration. The surface areas of the three sample areas would be calculated and the percent of these surface areas as part of the whole surface area would be determined. The sum of all these sample areas would be the total surface area of the structure and the sum of the percent surface areas represented by each area that was sampled would be 100 percent.

if,	surface area	and	total lead (Pb) concentration of sample		
legs	35 %	x	5.43 %	=	1.90 %
center column	15 %	x	3.26 %	=	0.49 %
reservoir	50 %	x	0.87 %	=	0.43 %
	100 %				

then, lead concentration for water tank = 2.82 %

With the size and cost of these repainting projects, it is very important that the lead content of the existing paint be adequately represented. The more good samples of paint that are collected, the better these samples will represent the coating on the entire structure. This is why multiple samples are required in subpart 2. The equation in subpart 3 provides a means to calculate an average value of lead content where more than a single sample is collected. It is reasonable to apportion the concentrations of lead in the samples according to the relative surface areas of the respective parts of the structure that are sampled. This will give a more accurate representation than a simple average of multiple samples which would bias the final product to either greater or smaller lead concentration.

Part 7025.0240, Notification

Subpart 1. This subpart states that the owner shall provide notice as described in items A and B at least 10 working days before the start of removal of lead paint from a total exterior surface area greater than 500 square ft on one steel structure or on more than one steel structure at one location during one year. It is reasonable to require the owner to provide the notice because the owner has tested the paint as required by part 7025.0230 and because the owner of the steel also owns the coatings on the surface of the steel. In addition, it is important that one party be responsible for the notification. The ambiguity in the phrase "owner or contractor" may allow miscommunication between these parties. However, the owner may specify in the contract that the contractor do the notifications.

It is reasonable to notify at least 10 working days prior to paint removal to allow the residents of buildings, the owner of a child care building, and the administrator of a school building to plan to implement the measures cited in items A, B, and C of subpart 2, if such measures are necessary, and for MPCA staff to know in advance of the lead paint removal project via the notice to the commissioner of subpart 3.

It is reasonable to require notification of lead paint removal from surface areas greater than 500 ft^2 because surface area is one of the factors that determines potential lead contamination. An exemption is warranted so that the owners are not obligated to notify the MPCA or the occupants of nearby properties of removal of "small" amounts of paint. It would not be appropriate, however, to exempt from this requirement removal of paint below a certain lead content without regard to surface area because of the large amount of particulate matter that may be generated and released and because of the amount of lead on the entire surface of very large structures. Such an exemption would require the use of two different factors. lead concentration and surface area. It is more simple to use only one factor, surface area, for notification requirements. The factor of distance to the most sensitive receptor properties is accounted for in the distance requirement set forth in item A below.

It is important to remember that the provisions for pollution control apply to all lead paint removal including those without notification and those where only a portion of the entire surface is repainted. Spot repairs on both storage tanks and bridges and total paint removals from the smallest storage tanks would remove less than 500 ft^2 of paint in most cases. The threshold surface area is one of two conditions for notification of potentially affected "neighbors." The other is the distance factor, described in item A, which is a function of height. The combination of these factors, one absolute and one relative, is appropriate, whereas a larger threshold value for surface area without an increase in the function of height that determines the distance of notification may not be conservative enough. Increasing the surface area number may not provide adequate notice to the occupants of the buildings cited, especially where high concentrations of lead are removed.

The primary purpose of the notification of the neighboring properties cited is prevention of exposure to lead paint particles. As described in subpart 2, it provides a means for neighbors nearest the structure to protect properties from potential contamination. It provides these parties information about the project necessary for applying these protective measures. Also the notice provides a means for the owner to add additional information in order to communicate the nature of the problem of corrosion, lead paint removal, and compliance with state regulations if he or she chooses. Notices in the past have included this kind of information and can serve to allay anxiety and answer questions about what is happening. The people who use the properties within the notification zone will observe paint removal activities of this scope without a written notice, so the idea that these neighbors would be unaware of what was happening without the notice is not correct.

It is reasonable to use one number (500 ft^2) for surface area, whether the removal of lead paint is from a single structure or from multiple structures at one location during one year because the same amount of paint would be removed. This latter situation would pertain at a tank farm where spot repairs are made to the coatings of a number of tanks during one season.

Item A. This item states that the owner must give written notice as required in subpart 2 to the adult residents of buildings, and to the owner or administrator of any child care or school buildings, within a distance to a single steel structure of 50 ft or twice the height of the structure, whichever is greater, but within 200 ft of a bridge portion. It is reasonable to require written notification to these individuals because these buildings are, in general, the most susceptible to the effects of lead contamination. Residents of houses or apartment buildings include adults and children. Contamination of housedust with lead paint particles is a serious problem because, in general, this is the primary source of lead exposure in small children. It is very difficult to remove particles of very small size, such as would be generated by abrasive blasting, and such cleanup can be costly. The occupants of these dwellings would be subject to chronic lead exposure. Even if children did not presently occupy these houses and apartments, lead contamination can be a persistent problem that can affect succeeding resident children. Children, especially under the age of six years, are the most susceptible to lead exposure. Child care and school buildings are similarly sensitive properties because of the presence of children. School buildings for adult students often provide space in the building for child care. Occupants of commercial buildings would not be resident children, and adult workers would be at less risk to the effects of long term exposure to deposited lead paint particles. One should remember that pollution control is required on all lead paint removal from steel structures, but due to the increased risk to children and the serious health effects of lead poisoning on children, the notices are directed at only those properties used or occupied by children.

The distance of notification in item A is reasonable because it is a function of the height of the structure and dispersal is a function of height. It would be unreasonable to apply an absolute distance of notification for storage tanks that would be the same for a 20 ft bulk fuel tank as for a 150 ft water tower. However, it is necessary to also cite a minimum notification distance to address structures such as above-ground pipeline that have little height, but due to their length, have a large surface area. It is reasonable to apply 50 ft as a minimum distance to all structures because abrasive blasting small bodies, such as portable storage tanks, causes dispersal that is independent of height.

A distance equal to twice the height of a single structure should achieve an important purpose of notification, stated in subpart 2, curtailing the presence of children in the area of lead paint removal, especially from large paint removal projects. The classification of storage structures in part 7025.0310 requires the use of Class II or Class III pollution control for lead paint removal where residential, child care, or school property is less than 300 ft from the steel structure. Therefore, lead paint removal projects on structures with heights less than 150 ft where notification of neighboring properties is required, will also require the use of either intermediate (Class II) or maximum (Class III) pollution control. In the case of the tallest water towers and transmission towers, the distance of notification could be greater than 300 ft. Although such structures would be contained, it is less likely that the buildings cited in this item would be found within a radius of twice the height of a transmission tower. If the nearest buildings were more than 300 ft distant from a very tall structure, it may be that notification would be given to people of a paint removal project done with minimum (Class I) pollution control. This situation would, in general, be an exceptional condition of lead paint removal from steel structures. If one argues that notification should only be necessary where the most potential risk is evident, that is Class II and III structures, one could also propose that the preventive measures that follow from notification are necessary to supplement the minimum pollution control requirements of Class I containment.

Rather than a relative number based on height, an absolute number (200 ft) is used as the distance of notification for bridges. This is reasonable because height is not as important a variable for most bridges as it is for storage tanks. Bridges are generally long structures where the horizontal dimension is more important in determining distance of dispersal than height. A number of large bridges in the state are higher above the ground or water than are storage tanks, but, in most cases, a distance of 200 ft would be greater than twice this height. Because of the very high concentration of lead in the primer paint on bridges relative to other steel structures, it is appropriate to use an absolute radius for notification that is greater than a distance based on the function of the height of bridges.

For multiple storage tanks at one location, the distance of notification is equal to the sum of the heights of individual structures from which lead paint is removed during one year, not to exceed 200 ft. It is reasonable to use an additive function to determine distance of notification for multiple tanks because dispersal is not as non-linear for these structures as for taller tanks. This provision would apply to both portable and fixed tanks. Adding the heights of different tanks accounts for the larger amount of paint removed from multiple tanks than would using the height of only one of the tanks. A maximum of 200 ft is reasonable because the height of each tank does not add a greater increment to mean distance of dispersal as does increasing height on a single structure. In addition, paint removal from tanks inside the perimeter of the storage tank "farm" would have less effect on contaminating surrounding property due to the shielding effect of the outer tanks.

This item further states that the owner must mail or deliver the notice to the owner or administrator of a child care or school building and must mail, deliver, or put on or under the door of each residence one notice for each single-family building and one notice for each unit of a multiunit building. These methods of delivering this number of written notices are reasonable requirements because it is most important that the owner of a child care building and the administrator of a school building each be informed of the lead paint removal activity so that they can restrict children's activity in the vicinity of the paint removal and take the preventive measures cited in subpart 2, if required. Similarly, it is important that each residence receive this notice. It would not be adequate, for example, to post one notice in or on a multiunit building whether it was comprised of rental apartments or condominiums because some of the residents would not see or read it.

Item B. This item states that the owner must mail or deliver written notice to the commissioner as required in subpart 3. It is reasonable to require notice to the commissioner of the MPCA because without such notice, MPCA staff may not be informed of lead paint removal activity or may only be informed by complaints received or by informal reporting by MPCA staff of observations made in the course of other field work or in before or after-hours travel. Reliance on complaints is not an effective means of preventing pollution. In many cases, reports of lead paint removal are due to large amounts of dust from sandblasting without adequate containment. In the time necessary to investigate such a situation, serious contamination can occur that can only be remediated with costly and inadequate cleanup. Without formal notice to the MPCA, staff will not know where and when lead paint removal is being done and will not be able to conduct inspections to verify compliance with these rules. In addition, the notice to the commissioner includes a copy of the notice to the owner, administrator, or adult residents from item A above, to ensure that such notification was done.

Lastly, this subpart states that if the owner or contractor postpones the beginning of paint removal more than five working days from the date stated in the written notices required by this subpart, the owner shall, within those five days, redistribute each of the notices with the revised schedule for paint removal. It is not unusual to experience unanticipated delays in the commencement of paint removal due to weather conditions, deliveries and assembly of large-scale containment materials, or resolving of contract language agreements. It is reasonable to require renotification under circumstances where postponement exceeds five days so that the notifyees of item A are apprised of the new schedule. This courtesy will reduce the inconvenience to the community of unnecessarily keeping windows closed and air conditioning units out of use for buildings nearby the structure. In addition, renotification will prevent non-productive site visits by MPCA staff who do inspections. For this same reason, there is a requirement that the commissioner must be renotified before the original starting date of paint removal.

Subpart 2. This subpart describes the contents of the notice to the residents, administrators, and owners required in subpart 1, item A. The notice shall state that lead paint is present on the structure, shall specify the days and the hours during which paint removal is anticipated, and shall advise the owner or administrator and the adult residents of buildings to prevent children under the age of ten years from entering the outdoor area within 100 ft of the structure or structures or bridge portion from the start of paint removal each day until the completion of cleanup after paint removal. It is reasonable to provide this information in the notices because lead paint removal has the potential to cause contamination of neighboring property. More important, this activity can cause contamination of the interior of these buildings and direct exposure of children to lead paint particles who would be in the vicinity of the site. It is prudent to disclose this information to those parties who can act to protect children's health, who would be most negatively affected by lead contamination. Without knowledge of the situation, these individuals cannot act in a responsible manner to prevent negative effects. The benefits of this provision are directed to those people who may be affected by lead paint removal other than the contractor or owner of the structure. This requirement also addresses the community right-to-know, especially where a publicly owned steel structure is repainted. However, it is to the advantage of owners to try to address concerns and to prevent lead exposure and lead poisoning. The advice regarding preventing children from entering the area and the preventive measures cited in items A, B, and C are provisions that may protect the owners from costly remediation or litigation.

The "exclusion zone" of 100 ft for children under 10 years old is reasonable because, as a single number, it is neither too conservative nor not conservative enough. Rather than use different numbers for different structures according to lead concentration, height, surface area, or method of removal, 100 ft is both more practicable than a larger distance and more preventive than a smaller distance. In cases of water towers, residential, child care, and school buildings will be notified at more than 100 ft from the paint removal so that advice will be given to children who live farther than this distance from the steel structure. The exception would be a ground storage tank with a height under 50 ft where the distance of notification will be less than a 100 ft radius from the tank. In residential areas, however, the municipality may choose to provide notice to a larger area and include more information than that prescribed by the rule. The reason for using a radius of notification that is a function of the height of the tank in subpart 1 is to prevent exposure to airborne particulates and to deposits of material that escapes the containment. Virtually all lead exposure to children from any source can be avoided and should be avoided. Emissions of small particulates that may escape pollution control methods can cause exposures to curious children who will be attracted to the site by the activity. It is very important that their presence be curtailed in the area at least until cleanup is completed each day. It would be not be reasonable, on the other hand, to require owners or contractors to prevent children from approaching this area because that is not really feasible. A physical barrier surrounding the structure with a diameter of 200 ft, for example, would add significant cost to the contract and may not prevent children's access. The owner may, however, enclose an area around the site or require the contractor to do so. Children have also been observed to play in sandblasting waste after the contractor has left for the day. This problem should be prevented by the daily cleanup provision for storage structures in part 7025.0330, subpart 6.

This subpart requires further that if dry or wet abrasive blasting is the method of paint removal, the notice must also advise the owner or administrator and the adult residents of buildings within 100 ft of the structure or structures or bridge portion, or within a distance equal to the height of the structure, whichever is greater, to close all doors, windows, and storm windows on the walls that face the structure to be abrasive blasted and their adjoining walls; to turn off all air conditioning units on the walls that face the structure and their adjoining walls, and tightly cover these units with impermeable material; and to take inside or remove from the exterior property all pets, pet houses, pet food and water bowls, and all children's toys and play equipment, or cover such equipment that cannot be moved, each day before paint removal begins.

According to provisions in parts 7025.0250 and 7025.0310, a residence, child care, or school building within 100 ft or within a distance equal to the height of a steel structure would require Class III pollution control for a bridge or Class II or III pollution control for a storage tank. Therefore, dry abrasive blasting with only curtains and ground cover would not be allowed. Nevertheless, as reported in the "Statement of Need" above, dry abrasive blasting or wet abrasive blasting of a bridge or of a storage tank with total containment and even with negative air may release particulate matter that would present a hazard for occupants of these buildings. Although the quantities of these emissions would be small relative to those that would be generated by unconfined abrasive blasting, they cannot be ignored whether they are due to accidents, careless use of pollution control, or to the reality of "total containment" that cannot achieve 100 percent containment efficiency.

The requirements of items A and B of this subpart are reasonable because closing openings to the outside and covering air conditioning units are simple but effective ways to protect the interior of the residence, child care, or school building from direct infiltration of lead paint particles. These measures are neither costly nor time consuming and these parties will have a large interest in protecting the interior of these buildings from lead contamination. It is reasonable to close openings on the walls that face the abrasive blasting and the walls that adjoin these walls because these are in closest proximity and the most vulnerable to infiltration of paint particles. Closing storm windows as well as windows will prevent contamination of the inside surfaces of the window frame or the window well from where lead particles can be easily transported into the building. Because many windows can only be effectively closed from the inside, and so could not be closed by the contractor or owner, it is reasonable to ask the residents, child care building owner, and school administrator to do this.

It is important to inform the occupants not to use air conditioning window units during abrasive blasting because to do so could blow small particle lead paint into the building. Some air conditioning units blow outside air into the house. Only the largest particle sizes that might reach buildings with such air conditioning would be removed by the filter. If these units were simply shut off without being carefully covered, particulates that deposit on and near the intake vents would be drawn into the building when they were turned on.

The requirements of item C are reasonable because these are simple ways to prevent exposure of children by deposition of paint particles on toys and play equipment and exposure of domestic animals by inhalation or ingestion or by deposition in living space. The absorption of lead paint particles by ingestion in small children due to contaminated surfaces and hand-in-mouth behavior is well established. Lead is also toxic to animals of all kinds, including dogs and cats, in whom lead poisoning by ingestion of lead paint particles is not uncommon.

Subpart 3. This subpart describes the contents of the notice to the commissioner of the MPCA, required in subpart 1, item B. This notice must include the information listed in items A through J, that is, the type of steel structure from which paint is to be removed and the address or location of the structure or structures; the scheduled starting and completion days and times; a copy of the painting records or paint test results required by part 7025.0230; the name, business address, and telephone number of the contractor, the consultant, and the owner, and the name of one contact person for each company and owner; a copy of the notice given to the owner or administrator and adult residents of each building under subparts 1 and 2 with a list of the addresses that received notification; the paint removal methods and the containment methods the owner or contractor intends to use to comply with parts 7025.0260 to 7025.0300, 7025.0320 to

7025.0350, and 7025.0360 to 7025.0370; the name and location of the waste disposal site where the waste collected as required by parts 7025.0260 to 7025.0300, 7025.0320 to 7025.0350, and 7025.0360 to 7025.0370, and disposed of as required by 7025.0380 will be deposited, or a description of the proposed disposition of waste materials that are not put in a waste disposal site; and any other information that the commissioner may request to determine compliance with parts 7025.0200 to 7025.0380.

Item E states that if the structure from which lead paint is to be removed is a bridge or a steel structure in part 7025.0370, item C, the notice must provide a description of the bridge or structure that includes the number of total square ft of surface area from which paint will be removed; the distance to the property nearest the bridge or structure for each kind of property designated in part 7025.0250; and the class of pollution control to be applied to each bridge portion or structure as required in parts 7025.0250 and 7025.0260 to 7025.0300.

Item F states that if the structure or structures from which lead paint is to be removed is either a storage structure or a steel structure in part 7025.0370, item A, the notice must provide a description of the structure that includes the number of total square ft of surface area from which paint will be removed; the calculation of potential risk factor (RF) from part 7025.0310; the distance to the property nearest the structure for each kind of property designated in the table in part 7025.0310; and the class of pollution control to be applied to the structure from the table in part 7025.0310.

The items of information required in the written notice to the MPCA are deemed essential to determine if the lead paint removal complies with this regulation. Items A, B, and D identify the time and place of the activity as well as the principals involved. This information is necessary to conduct effective inspections and also to communicate with the owner, contractor, and consultant regarding pollution control aspects of the project. Items C, E, F, and H provide information necessary to evaluate the concentration of lead in paint, the height and area of paint removal of the structure, and the distances to neighboring properties of different designation. These elements determine the class of pollution control and the alternative methods of containment and removal that comport to the requirements of that class for that structure. Review of the notice can confirm that the assessment of the pollution control requirements of the paint removal was done correctly. Item G of the notification requires a copy of the notice provided to the neighboring properties and a list of the addresses that received it. This will verify compliance with subparts 1 and 2 which describe this notice.

Item I provides a means for the owner of the structure, who is the waste generator or who employs the contractor who acts as waste generator, to identify the disposal method and destination of the lead contaminated materials. This information will be made available to compliance of MPCA staff in the Solid Waste and the Hazardous Waste Divisions. This subject is not the purview of the Air Quality Division although many inquiries are received and basic information is provided each year to owners, contractors, consultants, and others. Waste testing and disposal questions have for years been referred to MPCA staff in Generator Technical Assistance of the Hazardous Waste Division and the Ground Water and Solid Waste Division of the MPCA. It would be a serious omission to promulgate rules that regulate the removal of lead paint from steel structures by the effective use of pollution control and not deal with the waste that is produced which is collected as a result of containment. Incorporating this requirement in the notice to the commissioner should encourage compliance with existing regulations for solid waste and hazardous waste. Subpart 1 of part 7025.0380, Restrictions, requires compliance with existing waste rules.

Information regarding the waste disposal site or the disposition of waste materials should be available 10 days before the removal of lead paint. It is reasonable that this information be required in the notice to the commissioner. On large projects, it is not uncommon to "predetermine" the nature of the wastes that will be generated by trial removal and collection. Large structures can generate large quantities of waste. It can make a big difference in the cost of the work if this waste is hazardous or nonhazardous. Obviously, 10 days before any lead paint is removed, such information would be based on preliminary assessment. The duration of large projects can delay the determination of the means of disposal of the actual waste generated. This waste must be tested to determine its toxicity characteristics. There is a small likelihood that testing of actual accumulated waste materials would provide a different test result than the analysis done on test samples of waste. If this information was different than what was provided in the notice to the commissioner, the owner would have to submit a second notice at the time. It is necessary that the owner provide supplemental notices to correct any errors or deficiencies in the original notice, including any pertaining to waste disposal, as stated in the last provision of subpart 3.

Part 7025.0250, Classification of bridges

Subpart 1. This subpart states that the classifications in this part shall be used to determine the requirements in parts 7025.0260 to 7025.0300 that apply to a bridge or bridge portion from which lead paint will be removed. Further, the owner or contractor shall determine the class of each bridge or bridge portion from which lead paint will be removed. Basically, there are two different classes of pollution control for bridges which, combined with pollution control for water bodies, give a total of four classes. This table provides a simple summary of the four classes of pollution control for bridges or bridge portions.

		proximity to water body	
		no	yes
proximity to land properties	no	Class I	Class II
	yes	Class III	Class IV

The classification of bridges is based on the proximity of the structure to different receptor properties. These potential receptor properties differ according to their sensitivity to lead contamination. This means that a given quantity of lead paint particles can exert different effects on the public health or the environment according to the designated use of the property. The standards of distance are different for different properties. Subparts 2 through 5 describe Classes I through IV which require increasing pollution control. These classes use the standards of distance for different receptor properties cited in subpart 2 below, and again in subpart 4, to establish the requirements necessary for removing lead paint from a bridge. These requirement are described in parts 7025.0260 to 7025.0300.

The classification of steel bridges in this part and the application of these classes to parts 7025.0270 to 7025.0300 provide a reasonable means to address the issue of lead paint removal from these structures. The proposed rules would be shorter and more simple if all bridges were treated the same, regardless of their location or neighboring properties. For example, the rules might prohibit the use of dry abrasive blasting of all bridges with lead paint, or they might require the use of total enclosure with negative air on each structure. Such provisions, although they might achieve less pollution overall than the requirements presented here, would do so only at great additional expense to the owners. Instead, this rule proposes minimum pollution control on all bridges and a modulated response according to the perceived risk posed by the individual structure. The risk of the effects of lead contamination to the neighboring properties varies according to the designated use of the property. The purpose of these rules, as it concerns bridge maintenance, is to protect the environment and to provide additional protection to those properties that, by their designated use, would be more sensitive to the effects of lead contamination.

In like manner, the phrase "or bridge portion" is used throughout the proposed rules with regard to bridges. For purposes of pollution control requirements, the bridge can be segmented into "portions" that may differ by class according to their distance to receptor properties. This condition will affect longer structures more than small bridges. It is more likely that a short bridge will be entirely in one class. As an example, if the nearest properties to a bridge that crosses a roadway are a school property within 300 ft of one end and commercial property at 250 ft from the other end, then the bridge would be Class III for that portion within 300 ft of the school property and Class I for the remainder of the structure. A class of pollution control applies only to that portion of a bridge that is within the proximity factors enumerated in this subpart. This significantly reduces the costs of pollution control for the bridge as a whole. The larger bridges are the most costly to maintain and these structures will derive the greatest cost savings by the application of bridge "portions" to the paint removal.

It is reasonable to consider the distance of the bridge to different properties as a determining factor in the pollution control requirements for lead paint removal from the bridge. The variables that most distinguish different bridges in terms of potential for lead contamination are size, configuration, and location. There is relatively little variation in the concentration of lead in paint on bridges that have lead in paint in Minnesota. Length and width are the important determinants of size of bridges. Storage tanks, because of their structure, act like "point" sources of contamination when lead paint is removed. Bridges, on the other hand, act like "linear" sources. The length of a bridge, however, does not have a comparable effect on potential contamination as does the height of a water tower. Although larger and longer bridges bear more lead paint than smaller and shorter bridges, what is important is the distance of the steel surface to the surface of a particular property. A receptor property equidistant from two bridges that differ only by their length should experience the same level of lead contamination in a given interval of time if air movements are identical. For this reason it is reasonable to not classify bridges according to their length.

The contamination of the environment due to lead paint removal is a function of the surface area of paint removal and the surface area of deposition. These two factors have an inverse relationship that determines the amount of lead contamination of the environment. The surface area of a bridge, per unit of surface area of affected property below and adjacent to the bridge, increases with the width of the bridge. The concentration of lead paint particles that are dispersed and deposited on underlying soil and water is a function of the width of the structure and not its length. This was substantiated by analysis of soil lead data collected at girder bridges of different surface areas and reported at the first annual "Lead Paint Removal Conference" of the SSPC (exh. 2). The width of a steel bridge has an effect on lead paint contamination similar to the height of a storage tank. The surface area of a steel structure determines the amount of lead paint removed. However, the severity of potential contamination is expressed in the height of a tank and in the width of a bridge.

The determination of necessary pollution control for storage tanks in part 7025.0310 uses four variables: concentration of lead in paint, surface area, height, and distance to receptor property. For bridges, the lead concentration and the width are the most important factors that determine the "risk factor" or the potential for contamination. However, the lead content of bridge coatings is so great that other factors have relatively small effect. Although the differences in lead contamination of soil among bridges of different width were found to be significant, these differences were not dramatic. Therefore, only the distance to receptor properties is used to determine pollution control requirements for bridges in part 7025.0250. This same method was used in the "Recommendations for Pollution Control of Abrasive Blasting of Lead-Painted Bridges" that were mailed to the mayors in March 1990 and to the county engineers in May 1990 (exh. 6).

Subparts 2 and 3. For the purposes of the classification of bridges in these subparts, distance standards for a bridge or bridge portion are defined for different designated properties in subpart 2, items A through C. The standard for water bodies is either above a water body or within 100 ft of a water body. The other standards are 300 ft for residential property, child care property, school property, and playgrounds; 200 ft for public use property, commercial property, and protected natural area property; and 100 ft for industrial property and agricultural property.

These different properties are grouped according to general sensitivity to lead contamination which is expressed in different standards of proximity for each group. Ranking properties by group is done to reduce the complexity and length of the rule. There is variation in potential sensitivity among the different properties in each of the items. In addition, there is variation within each property designation. "Commercial property," for example, might include a restaurant, a hardware store, a childrens clothing store, or an indoor firing range. Other factors that characterize the bridge and affect potential for lead contamination are not apportioned in the classes of bridges, for example width or height of structure or the specific concentration of lead in the paint. As discussed earlier, there is either little difference in these variables among individual bridges or else their effect is of less importance than the lead concentration and the distance to specific properties in the vicinity. In addition, other independent variables such as conditions of wind speed and wind direction will vary with time at each site and this too will have some effect on potential contamination. Given these considerations, it is reasonable to establish three general categories of landbased properties and another for water bodies, with three different standards of proximity, rather than a different standard for each receptor property according to its designated use. To use fewer standards of proximity would require that commercial property be accorded the same protection as residential property or that agricultural land be accorded the same protection as protected natural areas.

Proximity standards were also used in the recommendations of 1990 although the numbers were somewhat different and fewer designated properties were cited in that document (exh. 6). "Proximity" for residential property and protected natural areas was within 200 ft of the property boundary and within 200 ft of school buildings, while "proximity" for commercial and public use property meant within 100 ft of the property boundary. "Public use area" was stated to include parking lots, recreational areas, and public buildings, but not roadways. As defined in part 7025.0210, Definitions, "public use property" has essentially the same meaning in the present rule. For brevity, child care property, playgrounds, industrial property, and agricultural property were not cited in the recommendation language. (The recommendations for bridges were only two single-space pages). Also, there was no proximity standard for water bodies, but rather "a body of water below or adjacent to the bridge" was used to prescribe Class II and Class IV bridges that traversed waterways.

It should be borne in mind that the recommendations of 1990 were not intended to be comprehensive nor, at that time, could they be substantiated by a large amount of reliable data. They were an "emergency" response to an "emergency" situation. In general, the samples that might have been used at that time to set distance factors and lead concentration factors for both bridges and water towers were not representative of the coating systems on these structures or they were not analyzed by appropriate test methods. In addition, new information of health effects of lead since that time has consistently reported negative consequences. Despite these limitations, the recommendations were used and still are used as guideline information to protect the public health and the environment from severe contamination due to the frequent occurrence of lead paint removal from steel structures.

The distance of the bridge to the most sensitive receptor properties, listed in subpart 2, item A, is to within 300 ft of the property. The proximity standard in the recommendations for these same properties was 200 ft. Two hundred ft is not protective enough due to the very high concentrations of lead in the primer paint of bridges, as described in the 'Statement of Need' above. As reported above in the discussion of the definition of lead paint (part 7025.0210, subpart 10), samples of sandblasting waste generated at bridges that had been analyzed for so-called "extractable" lead, were reanalyzed with acid digestion for total lead. This analysis occurred after the distribution of the recommendations. These data revealed lead concentrations in this material at factors 4 to 10 times that determined by the less-than-total "extractable" analysis. It is therefore reasonable that the standard of distance for these properties be 300 ft rather than 200 ft .

The properties in subpart 2, item B, are grouped in an intermediate rank of sensitivity to lead contamination and accorded an intermediate standard of protection of 200 ft. Although the distance of 200 ft for protected natural areas in item B is the same as the number in the recommendations of 1990, the proximity standard for public use property and commercial property is greater than the previously recommended 100 ft. The reason for the increase in this number is the same as that given above for the properties listed in item A. Industrial and agricultural property are grouped in the lowest rank of sensitivity to lead contamination with a proximity standard of 100 ft. Finally, the same distance standards of 300 ft, 200 ft, and 100 ft are applied to the same receptor properties in part 7025.0310, Classification of storage tanks, which determines the pollution control necessary for lead paint removal from storage tanks.

Subparts 2 and 3 state that a bridge or bridge portion that is NOT within 300 ft of residential, child care, or school property or a playground; nor within 200 ft of public use, commercial, or protected natural area property; nor within 100 ft of industrial or agricultural property; is Class I if it is also NOT within 100 ft of, or is NOT above, a water body; and is Class II if it IS within 100 ft of, or is above, a water body.

Subparts 4 and 5. These items state that a bridge or bridge portion that IS within 300 ft of residential, child care, or school property or a playground; or within 200 ft of public use, commercial, or protected natural area property; or within 100 ft of industrial or agricultural property; is Class III if it is NOT also within 100 ft of, and is NOT above, a water body; and is Class IV if it IS within 100 ft of, or is above, a water body.

Part 7025.0260, Pollution Control Required

This part states that an owner or contractor who removes lead paint from a steel bridge shall use the paint removal and containment methods required in parts 7025.0260 to 7025.0300, except that paint removal conducted only for the purpose of sampling coatings for analysis is exempt. This statement is made here before the treatment of the different classes of bridges so that the regulated parties are identified and so that the application of these parts of the rule to lead paint removal and containment is clearly stated. It is reasonable to exempt the removal of paint done in the course of sampling coatings for lead content so that the owner does not have to incur the costs of use of the removal and containment methods required in the rule in order to determine if the rule would apply to the removal of the coatings. Because only a small amount of paint is removed in sampling, it is not necessary to use the pollution control specified in the rule for lead paint removal.

This part further states that pollution control must be used on a bridge that traverses a state boundary, as if the bridge were entirely in Minnesota, unless the owner or contractor complies with requirements of the neighboring state or province that are more restrictive in preventing lead contamination than those in these parts. A large portion of Minnesota's state boundary consists of water bodies, in particular rivers. The Red River in the west, the Rainy River in the north, and the St. Louis, St. Croix, and Mississippi Rivers in the east are all boundary waters and they are traversed at different points by both roadway and railway bridges. Usually the interstate boundary line is somewhere near the midpoint of the river. At this time both Wisconsin and Ontario have relatively strict guideline requirements to prevent lead contamination from bridge maintenance. However, the Dakotas have not. It is reasonable to require that those bridges from which lead paint is removed that cross the state's boundaries be treated as if they are wholly in Minnesota in order to protect the air, soil, and water of the state from lead contamination. It would be unreasonable to allow an owner or contractor who removed lead paint from such a bridge to remove enclosures for pollution control when they reached the midpoint of the bridge. Dispersal of paint particles would pollute the water downstream without respect to state boundaries. The water quality standards in Minnesota rules apply to all the waters of the state and not only to those surrounded by Minnesota land.

This part further states that the owner or contractor who uses dry abrasive blasting for surface preparation after removing all lead paint with any other method shall use the containment methods required in part 7025.0270, subparts 2 and 3, except that the use of curtains is not required if (A) a low-dust nonsilica abrasive is used; (B) the total area of surface preparation is less than 1,000 square ft; (C) the bridge or bridge portion is Class I or Class II, or it is Class III or Class IV due to proximity of industrial or agricultural property only; and (D) particulate matter does not cross the owner's property line.

It is reasonable to address the issue of pollution control during abrasive blasting which might follow the removal of lead paint by another method. As stated in the 'Statement of Need,' (III.A.1.a. above), both the particulate matter rule (Minn. Rules pt. 7011.0150) and the visible emissions rule (Minn. Rules pt. 7011.0110) apply to abrasive blasting. The question presents itself if, once the lead paint is removed from the steel surface, containment is necessary where additional surface preparation is required before new paint is applied. It would be unfair not to address this issue without ambiguity so that owners and contractors know what costs of additional containment they may have to bear. Good maintenance practice requires adequate preparation of the steel surface before the new coatings are applied.

It is necessary to use the word "all" with reference to the removal of lead paint because the provisions for secondary abrasive blasting are predicated on the assumption that all lead paint has been removed by another method of removal. For this reason, confinement of emissions is not required subject to the conditions in items A through D. The proposed rules, Lead Paint Removal from Steel Structures, in that they address this activity, supersede the requirements of the particulate matter and visible emissions rules where the paint is lead paint, that is by definition it contains more than 0.5 percent total lead. On the other hand, abrasive blasting of painted surfaces that contain less than 0.5 percent lead, or of surfaces that are not painted, would be subject to existing air quality rules.

Abrasive blasting both removes existing coatings and prepares the steel surface for the new coatings. The degree of surface preparation is often specified by SSPC standards in the construction specifications of the contract. There are four standards for blast cleaning steel surfaces. They are SSPC-SP 7 (brush-off blast cleaning), SSPC-SP 6 (commercial blast cleaning), SSPC-SP 10 (near-white blast cleaning), and SSPC-SP 5 (white-metal blast cleaning). Other methods of paint removal such as hand tools, chemical stripping, and abrasive blasting with dry ice abrasive cannot provide a surface profile necessary for good adhesion of oil base and other coatings. Some power tools are not capable of removing all corrosion in cavities or from small areas where different surfaces meet and the tools cannot be used at an effective angle.

Wet abrasive blasting is a method of paint removal, cited in part 7025.0290, that reduces the distance of dispersal of the abrasive particles and paint particles compared to dry abrasive blasting. This method, however, will cause flash rusting of the steel surface due to even small amounts of water on the exposed steel. Rust-inhibiting chemicals can be added to the water during wet abrasive blasting to prevent rusting. Some of these, however, present certain health risks for workers, they can cause contamination if they leach into the soil, and they cost money. As an alternative, dry abrasive blasting or "brush" blasting can be used to remove the rust after wet abrasive blasting, prior to repainting. Final surface preparation by this method would not remove any lead paint so there would not be any lead paint particles in the emissions. According to the language of the rule, wet abrasive blasting conducted on a bridge of any class must be done inside curtains. Dry abrasive blasting could be done inside this same containment without additional labor or materials to contain the emissions. For this reason it is reasonable to require the use of this containment where dry abrasive blasting is done following wet abrasive blasting on a bridge or bridge portion that is Class III or Class IV due to proximity to properties that are not designated agricultural or industrial. Additional and unnecessary emissions to the air will be abated without significant additional cost.

Power tools and hand tools of different kinds remove coatings from a steel surface, but do not easily remove corrosion in pits below the surface. Abrasive blasting is the most effective means of removing this rust. As described in part 7025.0290, power tools require the use of curtains and ground cover unless they are equipped with HEPA vacuum units. Where curtains were used for lead paint removal, dry abrasive blasting could be used with the curtains in place, reducing costs of completing surface preparation before paint application. This situation would be similar to that described above for wet abrasive blasting. For power tools that are equipped with vacuum recovery, curtains are not necessary during paint removal. Subsequent dry abrasive blasting would not be confined, therefore, by a containment system already in place.

A low-dust nonsilica abrasive must be used as a condition for exempting the use of curtains. This term is defined in part 7025.0210, subpart 11. Like the 1,000 ft^2 surface area condition, these abrasives are specified to reduce the amount of particulates that may be emitted during surface preparation. Low-dust abrasives typically are nonsilica abrasives, so that they both produce less particulate matter and do not release respirable free silica. This provision uses the two modifiers "low-dust nonsilica" for the abrasive that can be used in abrasive blasting without curtains. Although these abrasives cost more than silica sand, the quantity used for final surface preparation following paint removal would be small compared to the amount necessary for both paint removal and preparation. Respirable size free (or crystalline) silica causes silicosis if it is inhaled over extended periods of time. The language of this provision is similar to the requirements for dry abrasive blasting following the removal of lead paint on storage tanks by either power tools or hand tools, or chemical stripping in part 7025.0320.

The surface area restriction of 1,000 ft^2 is applied on those bridge or bridge portions in the classes cited above where curtains are not required, in order to limit the quantity of particulate emissions that would not be confined. These conditions exempt the use of curtains only. Ground covers must still be used in these circumstances. Ground covers are relatively inexpensive and they are readily deployed. This containment is required as minimum pollution control whenever lead paint is removed from steel structures so these materials would already be on the site and they could be easily put in place.

It is reasonable to require the use of curtains on a Class III or Class IV bridge or bridge portion that is not so designated due to proximity to industrial or agricultural property, in order to prevent nuisance dust conditions during abrasive blasting because of the proximity of the other receptor properties cited in part 7025.0250 above. It is reasonable to not require curtains on a Class I or Class II bridge, if the total area of surface preparation is less than 1,000 ft^2, if a low-dust nonsilica abrasive is used, as long as particulate matter does not cross the owner's property line, because of the greater distance of these structures to the receptor properties. Waste abrasives themselves, in relatively small quantity, would pose little known risk to water bodies and they would not contain any heavy metals from paint removal. It is also reasonable that Class III or Class IV bridges, that are classified as such due to proximity to industrial or agricultural property only, need not use curtains where the coatings have already been removed, if the same conditions regarding surface area and abrasive and property line are met. There would be little negative effect of these quantities of abrasive blasting emissions on these two properties.

The fourth condition for not requiring the use of curtains stated in item D, that particulate matter does not cross the owner's property line, is a condition that has been required of sand-blasters who blast and repaint items outdoors that do not have lead in paint or that have less than 0.5 percent total lead in paint. These individuals may repaint a variety of service vehicles, school buses, farm implements, automobiles, and other vehicles and non-vehicles. Where lead paint is removed, testing and pollution control requirements have been applied to this practice, citing existing air quality and hazardous waste rules. These individuals have been told that they must confine particulate matter to their property if it is generated from items that have very little or no lead in paint. This material would not contain significant amounts of lead and would, therefore, be primarily nuisance dust. Secondary abrasive blasting of steel surfaces after lead paint removal causes airborne particulate matter that, similarly, does not contain heavy metals. This is essentially the same kind of waste material. Despite its relative "cleanliness," this material should not be allowed to deposit on property that does not belong to either the owner of the steel structure or the contractor who does abrasive blasting of mobile or portable structures. This is a policy that has been expressed to sandblasting contractors in the past and this provision in the proposed rule would be consistent with this policy.

Part 7025.0270, Class I bridge

Subpart 1. This subpart states that an owner or contractor who removes lead paint from a Class I bridge or bridge portion by dry abrasive blasting shall use the methods required in this subpart as minimum pollution control, or the owner or contractor shall use a method of removal from part 7025.0290. Further, for those portions of the bridge where curtains and ground cover cannot be used, the owner or contractor shall use the containment methods of part 7025.0280, subpart 2, item A or B. Class I bridges are the least restrictive class in terms of pollution control due to their distance to different receptor properties. These bridges are not within the distance standards for residential, child care, school, playground, public use, commercial, industrial, agricultural, or protected natural area property.

Minimum containment consists basically of ground cover and curtains, described in subparts 2 and 3, for both truss and girder bridges. Ground cover can be used to collect waste materials under the approaches of a bridge, either on the shoulders of an underlying roadway, or on either side of a waterway. Ground cover can also be used on the roadway underneath a grade separation bridge or overpass, if the roadway is wholly or partly closed to traffic. For those roadways that are not closed; however, one cannot use ground cover to collect the paint particles from the road surface. The methods set forth in part 7025.0280, subpart 2, item A or B, for Class II bridges describe two acceptable means for protecting a water body from contamination. These same methods can be used to collect paint particles above a roadway with suspended tarpaulins or scaffold. Rather than repeating this language, these methods are referenced in this part to enhance the economy of language of the rule.

The curtains and ground cover prescribed in this part, or the alternative containment methods in part 7025.0280, are minimum pollution control for dry abrasive blasting. Abrasive blasting is a method of paint removal, while curtains and ground cover are methods of containment. Abrasive blasting, or sandblasting, has the greatest potential for lead contamination of the different methods of removal. It is reasonable, and consistent with the concept of "minimum pollution control" requirements, that less contaminating methods of removal required for Class III bridges be acceptable also for Class I bridges. These methods are cited in part 7025.0290.

Throughout the proposed rules for steel structures of any class of pollution control, it is acceptable to also use the more restrictive methods of removal and containment that are specified for a higher class of structure.

Subpart 2. This subpart states that the owner or contractor shall use ground cover that consists of 100 percent impermeable tarpaulins to prevent deposition on the soil, and on vegetation, and that he or she shall overlap the tarpaulins at least 1-1/2 ft, and weight them to prevent separation, except on woody vegetation. The tarpaulins must cover the surface of all bare soil and vegetated areas inside the curtains required by subpart 3, Curtains or barriers, and they shall extend a minimum of 30 ft in all directions beyond the vertical extension of the curtains. Hard paved surfaces such as asphalt and concrete roadway, sidewalk, and slope paving may be left uncovered if they have an unbroken surface, and if the owner or contractor thoroughly cleans these surfaces as described in subpart 5, Cleanup of waste material.

The purpose of this subpart is to protect the soil from contamination by lead paint particles. The purpose of containment is to prevent contamination, and it is a more effective method of protecting the environment than cleanup that is conducted following unconfined abrasive blasting of lead paint. For example, the use of impermeable tarpaulins that have no holes, and that are weighted along the edges will protect the underlying soil from any contamination from lead paint removal. If this soil, however, were contaminated by lead-containing particles, either by not being protected by ground cover, or by the careless use or handling of ground cover during the course of paint removal, or following paint removal, then the only recourse to restore this soil to the condition prior to abrasive blasting is to either vacuum the surface of the soil or to remove the surface soil. Complete covering with impermeable ground cover is the most effective way of protecting the soil, and it requires less time than removal of all lead contamination from unprotected surfaces. The provisions of overlapping and weighting of the tarpaulins are simple, but effective measures to prevent loss of waste material between the tarpaulins.

It is reasonable to specify vegetation as well as soil in the ground cover requirement, because this term includes not only grass, which would be protected by ground cover, but also herbaceous forbs and woody plants, like shrubs and small trees. Deposition on the leaves of these plants would not be prevented by "ground" cover per se, and would contaminate the soil following wind or precipitation. It is important to cite vegetation in this item describing ground cover, so that these components of the environment are protected by covers over them and not only beneath them. This is communicated too by the phrase "in all directions," which would include overlaying of shrubs whose height makes this feasible.

The language in this item is essentially the same as that in the recommendations to the cities, and the counties of March and May 1990, except that the distance of ground cover in the proposed rule is 30 ft beyond the curtains, rather than 20 ft. Thirty ft is a more realistic number than 20 ft, because data show that particles can travel far beyond 20 ft from bridges that are sandblasted with curtains. A number of variables will determine the quantity of these emissions and how far they travel, the most important relate to the actual containment achieved with the containment method and materials that are used. This "containment factor," compounded with the existing windspeed and the pressure differential between the enclosure and the ambient air, will not achieve 100 percent efficiency throughout all phases of a bridge project. This is the reason for using ground cover outside the curtains.

The use of ground cover is the least costly item among containment methods in terms of labor as well as material. In addition, subpart 4, Windspeed limitation, below, prohibits "visible emissions" in the air and "visible deposits" on the ground beyond the distance of ground covers. If this does occur paint removal must cease, and additional ground cover may be used to contain the emissions. The actual distance of necessary ground cover from the curtain depends, therefore, on the distance of dispersal of visible emissions. Thirty ft as a minimum radius is a better number than 20 ft, because quantities of small particles that escape the curtains whether or not they are "visible" emissions to the air at any one time, will collect after some time as visible deposits on the ground. These deposits will accumulate faster closer to the bridge. In most cases at least 30 ft of ground cover outside the curtains will be necessary to prevent visible deposits on the ground during abrasive blasting of lead paint with curtains as required for Class I bridges.

The provision that allows hard paved surfaces to be left uncovered is reasonable, because if the surface is unbroken it provides an effective soil cover without tarpaulins, and if it is thoroughly cleaned after paint removal it will not act as a source of future environmental contamination.

Subpart 3. This subpart states that the owner or contractor shall use curtains rated by the manufacturer at not less than 100 percent impermeable to contain lead paint particles generated from both trusses and girders. These curtains must overlap by at least three ft unless the edges are completely joined. In the recommendations of 1990, "small mesh material" was acceptable if windspeeds did not disperse material beyond the ground cover. Although 85 percent impermeable fabric is cited in the proposed rule where wet abrasive blasting is conducted, curtains of this material are not adequate for dry abrasive blasting. This is ascertained by field studies as well as the testimony of contractors.

In addition, woven fabric curtains produced by some manufacturers that are 100 percent impermeable are stronger than material with larger interstices. Such containment products have increased burst strength with greater "thread count" and thread count increases with the impermeability of the curtain. With other manufacturers burst strength is a function of the mil thickness of the fabric, and this does not vary with permeability. The strength of the fabric is an important consideration where paint removal is done at an elevation where wind can exert significant force on the fabric. Any tears in the containment are not only an additional labor and capital expense, but they can also release contaminants into the environment that would require cleanup as visible deposits.

It is necessary that these curtains either be overlapped by at least three ft, or that they be completely joined along their edges to prevent lead paint particles from escaping the containment. There are a number of methods to join the curtains that are technically feasible. Ropes or cables can be laced through the grommets of adjoining curtains to join their edges. Otherwise, double-sided adhesive tape and plastic clips, both manufactured for the express purpose of attaching containment fabrics to each other or to the steel structure, are available to contractors and owners.

Item A. This item states that when lead paint is removed from girders and undertrusses, the owner or contractor shall suspend curtains from the bridge deck, so that the work area is contained on four sides. The owner or contractor must also seal the spaces between the beams above the transverse curtains. In addition, the curtains must extend to the ground cover and they must be anchored.

The girders of a girder (or beam) bridge or a truss bridge and the undertrusses of a truss bridge are structural steel components situated beneath the bridge deck oriented in the longitudinal axis of the bridge. It is generally easier to contain the removal of paint from these surfaces than for steel components above the roadway, because containment materials can be suspended from the bridge itself. Similar pollution control requirements can be specified for these different structural components.

It is reasonable to require that the area of paint removal activity on girders or undertrusses be contained on four sides with impermeable curtains, because to use less than this when conducting dry abrasive blasting would allow a great amount of particulate matter to be emitted. Deploying curtains in the transverse axis, perpendicular to the length of the bridge, in addition to the longitudinal axis will create a square or rectangular box of containment around the paint removal. These "box ends" can be suspended with clamps to the inner bridge beams, without great difficulty, much like the attachment of curtains to the outside beams.

The requirement to seal the spaces between the beams above the transverse curtains, similarly, is another provision to enhance the effective containment on Class I bridges. These spaces above the plane of the curtain can comprise a significant part of the total surface area of the enclosure beneath the bridge. The actual proportion of particulates generated that would be lost through these openings is a function of the surface areas of these spaces added together, relative to the total area of containment surfaces. In reality, because of the increase in air pressure due to abrasive blasting, this proportion is increased as a function of the difference between the air pressure inside and outside the containment. These outlets can be closed by rigid barrier material like plywood or by flexible materials like tar paper or floor coverings that are cut to fit the dimensions of the space.

It is reasonable to require that the curtains be long enough to reach the ground cover so that lead paint particles do not blow out of the enclosure. Curtain length is a necessary requirement, but by itself it is not sufficient to prevent pollution. In order to comply with the windspeed limitation in subpart 4 of the rules, it is necessary that the curtains extend to the ground, and that they be anchored as well. The means of anchoring the curtains is not specified in the rule, but staking them to the ground or weighting their bottom edges would prevent the effect of the wind. A curtain long enough to reach the ground covers will act like a much shorter curtain when acted on by the wind. The longer the curtain the greater the distance the bottom edge will be displaced from the vertical as an effect of the wind, and the greater the amount of particulate matter that will be lost. Anchoring the curtains will prevent this problem.

Item B. This item states that when lead paint is removed from overtrusses, whether or not the roadway is closed to traffic, the owner or contractor can suspend curtains both inside and outside of each truss from a height greater than the point of paint removal, with a width less than the length of ground cover, and with the bottom edges within curtains suspended from the bridge deck in the manner required for girders. If the roadway is closed to traffic there are two additional alternative methods of containment specified in subitems 2 and 3. The owner or contractor can suspend curtains outside of the opposite trusses from a height greater than the point of paint removal, with a width less than the length of ground cover, and with the bottom edges resting on the roadway or within curtains suspended from the bridge deck in the manner required for girders. As an alternative, the owner or contractor can suspend a rigid barrier outside the truss with the bottom edge resting on or directly above the roadway, inclined at an angle of 45 to 55 degrees with the truss, with a width less than the length of ground cover, a length not less than the height of the truss, and with the space between the end of the barrier and the truss closed with impermeable material. In addition, subitem 4 requires that if the roadway is closed to traffic, curtains shall be suspended across the bridge deck between the opposite trusses at both ends of the area of paint removal.

Basically, there are different methods cited in the proposed rules for paint removal from bridge overtrusses, depending on whether the roadway is closed or not closed to traffic. One method, enclosing the truss with curtains on both the inside and outside, can be used in either case. There are three methods available for bridges that are closed to traffic. Pollution control is easier and can be more variable when vehicular traffic is not a consideration. Basically, when the bridge is not in use, the truss superstructure can be treated like the girder substructure. In the place of the ground beneath the deck, the roadway itself can be used to collect the waste materials from abrasive blasting. Large enclosures can be constructed between opposite trusses that confine a portion of the entire upper bridge, rather than a part of or all of a single truss.

It is important that the curtains be suspended from a point above the area of paint removal on the trusses in order to confine the paint particles. The curtains themselves can be suspended from the truss with clamps or outriggers or from a cable that runs along the top of the trusses. The provision that requires that the bottom edges of the curtains rest either on the roadway or hang inside the curtains attached to the bridge deck, like the length requirement for the lower curtains, will help prevent the loss of paint particles due to the effects of wind and the turbulence generated by the blast nozzles. As described in item A above, the curtains on the substructure must extend to the ground cover beneath the bridge. Whichever method that is used will depend in some cases on the configuration of the bridge, but it is necessary that the waste materials be deposited either on the roadway or on the ground covers beneath the bridge to prevent their dispersal. The minimum distance of ground cover of 30 ft outside the vertical curtains would not be adequate by itself to prevent contamination of the ground due to dispersal from the greater heights above the bridge deck. It is reasonable, therefore, to specify that the curtain length be such as to direct the coating material to a suitable surface for collection, whether that be the roadway itself or the ground cover. It is similarly important that the maximum width of curtains be less than the length of ground cover beneath this span of the bridge, whether these curtains terminate on the bridge deck or inside the lower curtains.

The use of a rigid barrier to contain the products of paint removal is cited here as a third method for use on overtrusses. The minimum width is the same as for the curtains discussed above. The length of this barrier from the bottom edge to the top edge must not be less that the height of the truss above the roadway. Although a greater length may be more effective in confining particulate matter, it would be more difficult to attach and to move. The position of 45 to 55 degrees angle with the truss would achieve the most pollution control, and at the same time, allow the best access to the outside surfaces of these steel members. Any larger angle would give these barriers a "flatter" profile, and by lowering the outside edge of the barrier, would allow a lot of particulate matter to escape. The higher the point of paint removal on the truss, the more material would escape above the edge. This barrier would probably be made of plywood and it would probably be attached by cables to the top of the truss. Because of the angle of inclination, the abrasive waste would slide down the barrier and deposit on the roadway. This would also reduce the load on the barrier and the truss itself. Boards nailed across the width of the plywood would provide steps for the blaster or the painter to work from, or a ladder could be laid against the barrier to achieve the same purpose. This method would allow more work space to conduct paint removal, by comparison with curtains enclosing the outside of the trusses.

It is essential that the space between the barrier and the truss be covered with an impermeable material for the same reason that the transverse curtains are used underneath the bridge. This is both necessary and reasonable. The ends of the barrier and the vertical truss would provide suitable points to attach this material.

If the roadway is closed to traffic, then curtains suspended across the roadway between opposite trusses at both ends of the area of paint removal would simulate the configuration of containment underneath the bridge. These curtains, like those used to confine the trusses, should be hung from a height greater than the point of paint removal. As long as the roadway is closed, this additional containment, while relatively easy to implement, can prevent unnecessary contamination of the surrounding area. With certain wind directions, a wind tunnel effect might be created between the outside curtains that would increase the distance of dispersal in the direction of bridge orientation. This would be prevented by the curtains across the roadway. Whenever abrasive blasting is done with wind present, curtains situated across the direction of wind on two sides of the paint removal will serve as both a wind break and as a physical barrier. The upwind curtain breaks the force and the effect of the wind and the downwind curtain acts to block the transport of particles.

Subpart 4. This subpart states that the owner or contractor shall not conduct paint removal whenever windspeeds render the curtains and ground cover ineffective in containing particulate matter from both trusses and girders. If visible emissions of particulate matter occur in the air, or visible deposits occur on the ground, at a distance from the bridge greater than the distance of the ground cover, then the owner or contractor shall take any of the actions stated in items A, B, or C. These are: (A) add additional ground cover in the manner required in subpart 2, to a distance greater than the distance of visible particle transport or deposition; or (B) if paint is removed from overtrusses, enclose the top of the area of paint removal; or (C) if dry abrasive blasting is being used, use another method of paint removal from part 7025.0290.

This provision describes the circumstances under which the owner or contractor must stop work due to inadequate pollution control. The headnote to this subpart in the proposed rule is titled "windspeed limitation." It is air movement or wind that causes particulate matter to escape pollution control and to contaminate the environment, and it is the speed of this wind that will determine the distance of dispersal of this material. Rather than cite a numerical windspeed limit in the rule, a "performance" standard is applied that is partly dependent on the wind conditions. A numerical windspeed would not be practicable for several reasons. First, speeds would have to be measured with an anemometer and these measurements will vary with height and with the position of the instrument relative to the structure. Windspeeds will be greater on the upwind side of containment. Therefore, a specific method for determining the windspeed would have to be detailed in the rule. It would not be appropriate to use an "official" windspeed reported at the nearest airport, because this has little relation to the actual conditions that pertain where the paint is being removed. For bridges that traverse rivers, the winds at the work site may be significantly greater than those on flat land or in a protected area.

Second, one or more windspeeds in either mph or knots would have to be determined and implemented as numerical standards. This is not a practical means to achieve the purpose of pollution control where lead paint is removed from bridges. The particular speed of the wind and its direction may or may not cause "visible emissions...in the air, or visible deposits...on the ground." This will depend very much on the kind and degree of containment that is used on a particular structure. A relatively high wind speed may have relatively little effect on one containment system and a greater effect on another system. What this means is that in order to prevent a certain amount of contamination with windspeed limits, a different windspeed should be specified for each different structure, and perhaps for different parts of a single bridge. An effective windspeed limit could only be determined as work was in progress, and then by emissions of particulate matter from the containment. A numerical windspeed standard is neither necessary nor is it sufficient. On the other hand, a standard based on the effects of windspeed on the environment is a reasonable provision, and it directly addresses the purpose of the rule.

There are no monitoring requirements in the proposed rule. Air monitoring equipment is not required to determine the amount of air pollution that is caused by the removal of lead paint. Nor is soil or water sampling prescribed to document the amount of contamination added to these media. One of the obvious problems with monitoring is that the data that are derived describe conditions that obtained when the samples were collected. The interval between the time of sampling and the availability of data depends on the "turn-around" time of the analytical laboratory. In ordinary circumstances, it can take at least a week to get laboratory reports. At that time, if the data exceeded some standard or specification, the owner or contractor would know that there had been a problem. In fact, the "problem" could have gotten worse since samples were taken or the project may already have been completed. An additional problem that pertains to both air monitoring and to soil sampling is that the samples may measure high concentrations or zero levels depending on the position of the samplers, or the location of the samples relative to the source and the wind direction. If monitoring was mandated in the proposed rule, it would also be necessary to develop and apply standards for each of the media. In addition, it would be necessary to prescribe the number and position of the samplers in terms of height, distance from the structure, and wind direction, and also the sampling equipment, methodology, and analytical procedures. This, like the effect of a numerical windspeed standard, would add a lot of complexity to the language of the rule. Most important, these requirements would do nothing in themselves to prevent pollution due to the removal of lead paint.

The use of visible air emissions and visible deposits is a simple, "low-tech," but effective way to prevent contamination. Visible emissions and visible deposits are not prohibited in themselves. This performance standard is comprised only of those emissions in the air, and those deposits on the ground that are visible at a distance from the bridge that is greater than the distance of ground cover. Neither deposits on the ground cover nor emissions in the air above the ground cover cause contamination of the environment. The purpose of ground cover is to collect deposits that would otherwise contaminate the soil or water. The purpose of curtains is to restrict the dispersal of air emissions to the distance of ground cover. Those emissions that escape this containment must be addressed, and although these comprise both "visible" and "invisible" components, only those that can be seen are prohibited beyond the containment provided by the ground cover. It is essential that both air emissions and deposits on the ground be cited in subpart 4 as independent conditions, either one of which requires correction. Visible emissions in the air may be apparent before visible deposits on the ground. It takes a certain amount of particle accumulation to become a "visible" deposit, and especially if the ground is either vegetated or sandy or colored like the abrasive particles themselves. For this reason, this provision must include both air emissions or deposits on the ground as independent events.

According to data from the Bourne Bridge study (rf. 4) discussed in III.A.2.a. above, about 35 percent of total particulates generated by sandblasting steel are smaller than 50 um in diameter, and about 7 percent of these emissions are smaller than 10 um in diameter. The smaller the size of a particle, the farther it will move horizontally with air movement. It is generally considered that individual particles larger than 10 um can be seen with the naked eye. These particles are very small, and are generally considered to be the largest "respirable" size particles. It would take 100 of these particles edge to edge to make one millimeter. In field conditions, single particles of this size are not, in fact, visible. It is particles in aggregate that constitute visible emissions to the air or visible deposits on the ground. The more particles, the more they become visible and this is largely independent of their size. This provision is not a "zero emissions" standard, because of the two conditions that the emissions be visible, and that the emissions be visible past the distance of ground cover. The studies cited in the 'Statement of Need' above, document that even with total containment and negative air pressure, emissions can still be measured with air monitoring. "Zero emissions" literally cannot be achieved at this time, even with great cost of equipment and material. This provision for visible emissions and visible deposit addresses the most serious pollution without the deficiencies that would be introduced by monitoring and reporting requirements.

Where visible emissions are identified, the owner or contractor removing lead paint from a bridge can add additional ground cover to a distance greater than the distance of visible particle transport or deposition as stated in item A. As an alternative, if paint is removed from over-trusses as described in item B, the top of the area of abrasive blasting can be covered. If the bridge is closed to traffic, this could be accomplished by stretching containment fabric across the opposite trusses above the area of paint removal. Lastly, instead of dry abrasive blasting, the owner or contractor can use a method of removal from part 7025.0290 for Class III bridges. These methods are wet abrasive blasting, power tools or hand tools, dry abrasive blasting in total enclosure with negative pressure, or vacuum blasting. These procedures can be implemented either singly or in combination. It is implied in this subpart that paint removal must stop if the performance standards are not met and that the corrective actions in items A to C will be implemented before work continues.

There will also be circumstances where the owner or contractor will elect to stop work without making changes to either containment or methods of removal. Strong winds especially may force this decision. Containment fabrics that are installed and removed each day can be torn by wind, and these may be taken down to prevent such loss in windy conditions. This provides an additional economic incentive to stop work under the visible emission conditions specified in this regulation. Where permanent enclosures are used, the field supervisor may maintain a project shutdown, rather than implement the options enumerated in this subpart, where wind-speed or direction renders the pollution control ineffective. On some structures, particularly the higher bridges, abrasive blasting may be scheduled on a day-to-day basis for early and/or late in the day when windspeeds are generally reduced.

Subpart 5. This item states that the owner or contractor shall clean up all visible deposits of waste material containing paint or paint particles at the end of each workday from all areas on the ground, and the ground covers outside the curtains, and remove it from the site or store it either in containers or on top of ground cover and covered with impermeable tarpaulins. In addition, it states that the owner or contractor shall recover this material by manual means or by vacuum with HEPA filtration, but may not use an air pressure or water stream which redistributes the waste material. Further, methods of handling and movement of waste material shall prevent fugitive dust, and other loss of any material until final disposition of the material.

The proposed rule requires both containment during abrasive blasting and cleanup after paint removal to assure that material that is not collected by the containment is not allowed to remain in the environment. It is important that cleanup of waste material be done daily to prevent further dispersal of this material by wind, rain, and foot traffic of the workers. If the site is accessible by the public, children could be readily exposed to waste materials that are not confined or stored. The total lead concentration of the abrasive waste generated from bridges can be very high. In the past, there have been reports of children playing in the lead-contaminated waste sand collected beneath a steel structure.

Although the language in the windspeed limitation of subpart 4, above, prohibits visible emissions beyond the ground cover, it is necessary to also include this cleanup provision, which addresses visible deposits on both the ground and the ground covers outside the curtains. Realistically there will be some amount of these deposits at the end of the workday. After all, it is the presence of such deposits that is one of the two conditions that necessitates that work cease until the remedial options are exercised that are described in subpart 4. In addition, emissions of particulate matter in the air that are not visible as described in the windspeed limitation will, with time, accumulate as visible deposits on the ground. These deposits must be cleaned up every day. In addition, accidental releases of material also occur, and although as accidents they cannot all be prevented, they must be remediated. This provision requiring cleanup complements the language regarding primary pollution control that is found in the treatment of Class I bridges in part 7025.0270 as well as the other classes of bridges in the later parts. Basically, the contaminants that are not confined and contained by the curtains and ground covers or the other containment cannot be allowed to remain in the area of the bridge.

It is reasonable to specifically prohibit air pressure or water streams as methods of cleanup because these methods do not clean up the waste material. They redistribute the material and in the process make it less visible. Yet it is not uncommon for workers to use the blast hoses to "blow away" the waste material with air pressure. This is much easier and takes less time than actual removal of this material. Similarly, water hoses could be used to do the same thing. Pressurized water would be available where wet abrasive blasting was conducted. Manual methods of removal would include using shovels and brooms on the ground. Deposits on the ground covers could be removed by lifting the edges of the tarpaulins, and then shoveling or pouring the abrasive directly into containers or a contained pile. Flat shovels would work well on unvegetated soil, but on vegetated areas or rocky surfaces, vacuuming would be the most effective method of recovery of the paint particles. HEPA filtration is cited to prevent ambiguity. The smallest particles would not be stopped by filters with less efficiency, but would be reentrained during the cleanup. Having been once captured, it would be contrary to the purpose of pollution control to release these particles into the environment again.

It is reasonable to require that methods of handling and movement of the waste material prevent fugitive dust because loss of particulates is inimical to the purpose of cleanup. It is necessary that this material, once it is "safely" removed from the steel structure, be "safely" handled until it is finally disposed. Any activity that exposes particulate matter to the effects of air movement will result in escape of waste material. Throwing material from a shovel or letting it fall from any height into a pile, a container, or the back of a truck, will rapidly reduce the volume of material as a function of the existing wind speed. Rather than prescribe detailed methods of handling or the use of water to prevent generation of airborne dust, the proposed rule simply states that the owner or contractor "..shall prevent fugitive dust and other loss of any material." "Movement of waste material" would include the transport of the collected material to a storage site or a disposal site. This means that, among other things, a truck box would have to be covered in order to prevent the effects of wind during transportation on a roadway, and the material may have to be kept wet.

Part 7025.0280, Class II bridge

Subpart 1. This subpart states that an owner or contractor who removes lead paint from a Class II bridge or bridge portion by dry abrasive blasting shall use the methods required in part 7025.0270, and in this part as minimum pollution control, or the owner or contractor shall use a method of removal from part 7025.0290. If the bridge traverses a narrow water body as stated in subpart 3, the owner or contractor shall comply with the standards specified under either subpart 2 or 3.

This part sets forth the methods of removing lead paint by abrasive blasting from Class II bridges, which are either above a water body or within 100 ft of a water body, but otherwise are like Class I bridges in that they are not within the distance standards to residential, child care, school, playground, public use, commercial, industrial, agricultural, or protected natural area property. Because of this, it is reasonable to refer to the containment methods in part 7025.0270 for Class I bridges, which can be used to protect the land surfaces under the approaches of the bridge. The provisions in subpart 2 are pollution control methods to protect the water body beneath the center span of the bridge. The methods cited in subpart 3 can be used instead of the methods of subpart 2 in order to protect narrow bodies of water. The statement to this effect is included, so that it is explicitly understood that the methods that are practicable for relatively narrow water bodies supplement the methods for "any body of water," and can be used where applicable over creeks and streams.

As further water pollution prevention, the proposed rule requires that the owner or contractor use a boom on the downstream or the downwind side of the bridge, with skimming or vacuuming of the water surface to remove paint particles before they sink, except on those parts of the water surface where frequent boat navigation or water turbulence prevents effective recovery. Control of water pollution with booms that restrict and remove the contamination are often referred to as "secondary containment" in the lead paint removal industry. Like the cleanup provision for the ground and ground covers in subpart 5 above, this requirement addresses the loss of particulate matter over the water. A large proportion of this material will float on the water surface, and can only be recovered with a boom in combination with skimming or vacuuming of the water surface. The boom must be placed downstream of the bridge on most waterways where there is a water current. Only on river backwaters perhaps, would a boom on the downwind side be effective in collecting the paint particles that have escaped the primary containment. Where a bridge traverses a lake or marsh, the boom will be deployed downwind of the bridge because the wind will move the particles in a downwind direction in the place of the water current. Booms that have been used beneath bridges in different parts of the United States have been used to prevent the material from floating downstream for esthetic reasons, not for collecting the paint particles. This floating material is often referred to as "scum," and whatever was not eventually saturated and sunk at the boom was frequently deliberately sunk, rather than removed from the water surface. In order to prevent lead pollution of the water body, the dispersal of the material must be prevented and the material must be removed. It is reasonable, therefore, that the boom be specified with skimming or vacuuming of the water surface. Skimming is accomplished with fine-mesh nets or fabrics from a boat, and vacuuming similarly will be done by boat or from a low-lying bridge deck.

On certain waterways the use of booms is not feasible. On the Mississippi River where barge traffic lanes cannot be closed, booms cannot be used on navigation channels. However, abrasive blasting above portions of the river that are not navigable channels must be done with booms on the downstream side. Booms on shallow turbulent water will not achieve their purpose. Many of the particles will be washed over the floating barrier by the fast current. Also rapids in the river or stream will break the surface tension and cause many of the particles of paint and abrasive material to sink. Booms deployed below the area of turbulence will stop relatively few particles on the surface from moving downstream.

Subpart 2. This item states that in order to prevent lead paint particles from entering a water body, the owner or contractor shall (A) suspend impermeable tarpaulins horizontally beneath the bridge deck or suspend nets lined with impermeable tarpaulins horizontally beneath the bridge deck to contain waste materials; or (B) suspend scaffolding that supports a platform beneath the bridge deck lined with impervious materials to contain waste materials; or (C) secure a barge or a raft covered with impervious materials beneath the bridge and use impervious materials to direct waste material to the barge; or (D) collect and remove waste material from a frozen water surface with ground cover as required in part 7025.0270, except that the ground cover must extend in a downwind direction on the ice to a distance greater than the highest point of paint removal.

Furthermore, the curtains used to contain the girders and trusses in part 7025.0270 shall extend from outside the painted surfaces to inside the tarpaulins, or to the platform or the raft, or inside impervious material that extends to inside the barge, or to the ice.

These methods can be used for the protection of any body of water regardless of its width. The four methods serve as the primary containment where paint removal is done above a water body. It is important to point out that these methods are alternatives available to the owner or contractor. This is indicated by the word "or," which is used throughout the text of the proposed rule to distinguish one option from another. It is also important to remember the provision under part 7025.0220, Compliance, subpart 2, which explicitly states that the owner or contractor may use "methods of ...paint removal, and containment other than those specified" in this rule subject to the approval of the Commissioner.

The first two methods of containment are suspended from the bridge structure and use impermeable tarpaulins, or other materials to prevent contamination of the aquatic environment. The use of a horizontally suspended tarpaulin is probably the easiest way to confine particulates generated from work done on girders or undertrusses over water. In industry this system is sometimes referred to as a "diaper." Nets underneath the bridge lined with tarpaulins would significantly strengthen the containment, and allow the accumulation of a lot more abrasive material in the tarps before they would be torn by the weight and dump contaminated waste. Cargo nets of rope mesh would serve this purpose. Of course this containment underneath the bridge would have to be attached along its edge at enough points to distribute the load and prevent failure. In order to use this system on a girder or undertruss bridge, the abrasive blaster might work from a "snooper" boom from a truck parked on the roadway. Narrower bridges would allow access to all the coated steel with such a method. Similarly, a vacuum truck on the roadway could be used to empty the tarps of the waste material. The use of suspended scaffolding with a platform, described in item B, would be applied to wider bridge bodies. Such a platform would provide increased mobility to the blasters and the painters, and complete access to the steel surfaces. This kind of containment could be emptied by vacuum truck, or by a funnel system to a barge in the water, or to the shoreline.

The other methods in this item collect lead paint particles beneath the bridge in a manner similar to the use of covers on the ground. The barge provides a practical means of meeting this need if particulates are not lost between the bridge and the barge. Impervious materials are specified here in order to confine and direct this waste as it falls. Such materials include impermeable fabrics, or rigid materials in combination, that funnel the material into containers on the deck of the barge or raft or into the hold of the barge. Mesh fabrics that are not impermeable experience less wind resistance, but they allow significant amounts of abrasive waste to escape. This was first reported in the Middle River Bridge study in California that was published in 1977 (rf. 18). Barges and rafts have very shallow draft which minimizes the effect of water depth on their use. Obviously, barges cannot be used in water where they cannot go. However, for narrow bodies of water, the construction of floating or fixed platforms as cited in subpart 3, below, would serve the same purpose. These, however, would not be mobile and the collected waste material would have to be removed from the platform to the water's edge or to the bridge deck.

The last pollution control alternative for Class II bridges under subpart 3 specifies the collection of abrasive waste on the frozen surface of lakes and rivers. Ice provides a large, flat, and relatively smooth surface beneath many bridges in winter. As a solid continuous barrier, it also provides complete protection of the water underneath the ice. It is reasonable to require impermeable tarpaulins be used over the ice, because foot traffic and the wheels of equipment would force abrasive and paint particles into the ice surface from which recovery would be difficult. If the ice is thick enough, paint removal may be conducted from the ice surface, rather than from the bridge deck. In addition, some of the slag and mineral abrasives are dark colored, and by absorbing heat, would melt the ice and mix with this water on the ice surface. This too would be difficult to remove, because it would be below the plane of the ice surface. Using front end loaders or other means to scrape the contaminated waste from the ice surface would not remove all the particles. At night this mixture would refreeze embedding the paint particles beneath the ice surface. In contrast, using impermeable ground covers as specified in part 7025.0270, subpart 2, will provide total protection of the underlying ice. Any material left on or in the ice would become part of the water body with the spring thaw.

It is reasonable to increase the distance requirement for these ground covers in a downwind direction from 30 ft to a distance greater than the highest point of paint removal, because it is very easy to lay out ground covers on the ice. Of course, this requires the use of more tarpaulins than over land surfaces. There is little question that the extended use of ground cover in a downwind direction will prevent the contamination of the environment with large numbers of very small particles. As described in part 7025.0270, subpart 2, a minimum of 30 ft of ground cover is required on all sides of a bridge span over land. The use of additional ground cover underneath these spans is constrained by physical factors like the width of right-of-way, the presence of trees and shrubs, and the difficulties of providing effective cover over these areas. On the upwind side of a bridge over ice, a minimum distance of 30 ft of ground cover would be required, the same requirement which applies in all directions beneath Class I bridges. The purpose of using ground cover on the upwind side is the same for bridges over water and over land. It will contain the large size particles, which are the least subject to the effects of wind, and which, if they escape the containment, will deposit on all sides of the curtains. The turbulence generated by abrasive blasting will act on these particles independent of ambient wind conditions.

The requirement that the curtains used to contain the girders and trusses in part 7025.0270, shall extend from outside the painted surfaces to inside the tarpaulins, or inside the platform, or inside impervious material that extends to inside the barge, or to the ice, is reasonable in order to provide a means of collecting the paint particles generated by the removal of paint from the steel surfaces. These different phrases address the different means for protecting a body of water under subpart 2. The assumption here is that where paint is removed from overtrusses, it will be done at the same time as paint removal from the girders or undertrusses beneath them. This would be the most efficient way to repaint such a structure. This language simply states that the containment on the girders and trusses over water must confine the material, so that it is contained and recovered by the different devices enumerated in item A that prevent its deposition in the water body. This language is homologous to that in part 7025.0270, subpart 3, for Class I bridges that requires the curtains on overtrusses to extend inside the curtains beneath the bridge deck .

Subpart 3. This subpart describes two methods that can be applied as alternatives to the methods in subpart 2 in order to protect narrow bodies of water. In the first, the owner or contractor shall suspend an impermeable tarpaulin across the underside of the bridge deck at a point more than halfway across the water body and anchor the bottom edge of the tarpaulin at the farther bank so that it overlaps the ground covers. The space between the beams above the tarpaulin must also be sealed. The procedure is repeated in the opposite direction to address paint removal on the other side of the midpoint above the water. As a second method, the item states that the owner or contractor shall cover a platform above the water surface with impermeable tarpaulins that overlap the ground covers.

In combined subparts 2 and 3 of the proposed rule there are six methods of pollution control to protect water bodies. The methods cited in subpart 3 can only be used over surface water that is narrow enough to make them feasible. On the other hand, three of the four methods cited in subpart 2 (items A, B, and D) could be implemented over water bodies regardless of their width. Depending on the specific conditions of a particular bridge, four methods to prevent water contamination could be applied to the larger water bodies, and five methods could be applied to protect relatively narrow water surfaces beneath the bridge. These could be creeks, streams, drainage canals, or small wetlands like pothole marshes.

The first pollution control procedure delineated in subpart 3 uses an impermeable tarpaulin as an inclined plane to direct the waste materials generated by abrasive blasting of the steel above the water to the lakeshore or streambank. The bank would be covered by impermeable ground covers as required in part 7025.0270. It is reasonable to specify that the suspended tarpaulin be anchored at the bank so that it overlaps the ground covers. If the ground covers overlapped the tarp, some material would be lost between the two. It is important that the spaces between the girders above the suspended curtain be sealed just as with the transverse curtain suspended beneath girders and undertrusses for Class I bridges in part 7025.0270.

The method of attaching the tarpaulin underneath the bridge at a distance more than half way across the water, and with the bottom end anchored at the farther bank is a procedure that ensures that the paint removed from the steel above the water will be contained. The language "more than half way across the water body" ensures that all this material will be collected if two other conditions are met, i.e., the bottom end of the tarpaulin goes to the farther bank, rather than the near bank, and the procedure is repeated from the opposite direction. "More than half way" means that this tarpaulin could not be attached right at the midpoint of the water body. The midpoint on the water is projected vertically to the bridge, and the tarp is attached at some distance on either side of this point. As a consequence, one edge of the water will be farther from the attachment point than the other. The bottom end of the tarpaulin must be anchored at the "farther" bank where it overlaps the ground cover. By repeating this operation in the opposite direction, there will be an area of overlap on the steel girders in the middle of the span that is contained inside the angle of the tarpaulin extended in both directions.

This method is unlike the others in that, to be successful, it must be done in two similar phases. For this reason, the provision states that the process must be repeated. In practice, the tarpaulin could be moved and suspended many times as work progressed across the water body. With the bottom edge fixed to the bank or shore, the angle made by the top of the tarpaulin at the point of attachment with the bridge would be smaller and smaller as one reached the midpoint above the water. However, due to the considerable effort in reattaching this tarpaulin and also in repeatedly sealing the spaces formed between the beams, labor costs would be greatly increased. The two phases described in the proposed rules would be the most efficient way to implement this method of containment. In addition, it specifically addresses the need to contain the center area of the bridge steel. Because of the length of tarp needed to reach this part of the bridge, and because it is farthest from land, an owner or contractor might ignore adequate pollution control at the middle of the bridge.

Because narrow bodies of water are usually also too shallow to allow the use of a boat of any kind to collect the waste material, a platform is specified in item B to serve the same purpose. This structure could either float on the surface of the water, or be supported by members that span the water from bank to bank. It is reasonable that this platform be covered by impermeable tarpaulins, so that particles that are prevented from dispersal by the curtains and are collected on the top of the platform can be removed without entering the water. Unless these covers are impermeable, material might drop through boards or remain on parts of the platform if it had a structured surface. Again, impermeable tarpaulins provide the quickest and most effective means of collecting particles that deposit on a surface beneath a steel structure.

This item further states that the curtains used to contain the girders and trusses in part 7025.0270, shall extend from outside the painted surfaces to inside the tarpaulin or inside impervious material that extends to the platform. It is necessary that the particles generated by abrasive blasting be directed by impermeable curtains extending from outside the girders or trusses to inside the suspended tarpaulin, described above, or to the platform. This language is similar to that in subpart 2 above, for Class II bridges, which conforms to the language in part 7025.0270, subpart 3, for Class I bridges. It is used for the same reasons as stated earlier. It is not adequate to contain the removal of lead paint with suspended curtains which serve to restrict the dispersal of material in a horizontal dimension. The vertical movement of these particulates must be controlled until they finally deposit on protective covers. For this reason it is necessary and reasonable that the containment for different zones or "strata" be explicitly combined to confine the particles throughout their descent. When a particle has come to rest, it no longer has the potential to deposit in any other place, and contaminate that site. The point here is to ensure that the particles that are released by the abrasive blasting process are confined throughout their movement until they eventually settle. The original lead paint adheres to the steel surface, bound in a two-dimensional matrix of resin in a state that cannot contaminate the environment until this coating deteriorates. The purpose of this rule, as it relates to paint removal by abrasive blasting, is to have an end product of paint particles held by gravity in a three-dimensional pile on an impermeable surface. In this state, with careful handling, it can be disposed of in an appropriate manner.

Part 7025.0290, Class III bridge

Subpart 1. This subpart states that an owner or contractor who removes lead paint from a Class III bridge or bridge portion shall use the methods required in part 7025.0270 as minimum pollution control, except as provided in subparts 2, 3, and 5, and a method of paint removal from this part. This part sets forth the methods of removing lead paint by abrasive blasting from those bridges which are in proximity to residential, child care, school, playground, public use, commercial, industrial, agricultural, or protected natural area property. Class III and IV bridges, because they are sited near these properties, require more pollution control than Class I and II bridges. "Nearness" is defined differently for different properties according to part 7025.0250, Classification of bridges. Better pollution control is achieved by using the same containment specified for abrasive blasting of Class I bridges with methods of paint removal other than dry abrasive blasting. For the economy of the language of the rule it is reasonable to refer to the methods in part 7025.0270, for Class I bridges, rather than to repeat this language. Because bridges in Class III are not nearby water bodies, containment with curtains and ground cover can be used to protect the land surfaces under the approaches of the bridge, and suspended tarpaulins or platforms can be used to contain paint removal above the roadway.

Each of the subparts 2, 3, and 5 contains some provision that differs from the language in part 7025.0270. In subpart 2, the 100 percent impermeable curtain requirement is changed to 85 percent for wet abrasive blasting. In subpart 3, curtains are not required if the power tools are equipped with vacuum attachments that prevent emissions of particulate matter. Neither are curtains required if the conditions for vacuum blasting are met that are specified in subpart 5.

Subpart 2. This subpart states that the owner or contractor who uses wet abrasive blasting shall use curtains rated by the manufacturer at not less than 85 percent impermeable, and if dry abrasive blasting is used for surface preparation. Further, the owner or contractor shall use an amount of water such that dispersal of particulate matter is suppressed without loss of waste material from the ground cover or impervious materials by runoff. Wet abrasive blasting is defined as "abrasive blasting with the addition of water to the air abrasive stream" in subpart 22 of part 7025.0210, Definitions.

The water used in wet abrasive blasting adds both weight and volume to the particles that are generated during paint removal compared to dry abrasive blasting. For this reason, a less restrictive permeability requirement is applied to the curtains used in containment. The ground cover requirement is not affected. The removal and containment methods used to address the removal of lead paint from Class III bridges should prevent more contamination than the pollution control methods used on Class I bridges. Therefore, wet abrasive blasting with 85 percent impermeable curtains should prevent more emissions than dry abrasive blasting with 100 percent impermeable curtains. Fine mesh curtains of 85 percent impermeability are a standard product. Such fabric should, because of the larger particle size generated by wet abrasive blasting, adequately prevent transmission of lead paint particles through the curtains.

The greater weight of the wet particles means that a large number of the particles that might escape primary containment will deposit on the ground covers which extend a minimum of 30 ft from the curtain. An owner or contractor may use fabric of smaller mesh size or impermeable fabric, of course, but interstices of some size may allow better ventilation and more rapid evaporation of water, for example, and may be preferred for this method of removal. If dry abrasive blasting is done after wet abrasive blasting to remove flash rusting, the same 85 percent rating of curtain can be used. This is reasonable because this containment would remain in place or would be at the work site, and because there would not be lead paint left on the steel surfaces. The same condition regarding minimum 85 percent impermeable curtains is provided for wet abrasive blasting in total containment on Class III storage structures in part 7025.0350, subpart 4. Paint removal with wet abrasive blasting on Class II storage structures in part 7025.0340, subpart 2, however, requires impermeable fabric because it is done with partial containment only.

The provision that limits the amount of water to that that suppresses the dispersal of particulate matter in the air, but prevents the loss of material from the ground cover or impervious materials, is reasonable because to simply transfer contaminants from the air to the soil is not a net benefit to the environment. Reducing the distance of dispersal of particles in the air with the use of too much water can cause contamination of the soil because of runoff. This same concern is addressed in the restriction on the use of water blasting in part 7025.0380, Restrictions, subpart 3. The same limit on the amount of water that can be used for wet abrasive blasting with partial containment on Class II storage structures is stated in part 7025.0340, subpart 2, and for wet abrasive blasting in total containment on Class III storage structures, in part 7025.0350, subpart 4.

Subpart 3. This subpart states that the owner or contractor who uses power tools or hand tools shall use ground cover and curtains unless the power tools are vacuum-equipped, and all parts of the vacuum equipment are in a condition that prevents emissions of particulate matter, then the use of curtains is not required. Power tools include electric or pneumatic needle guns, descalers, rotary peening tools, and grinders. Hand tools include metal scrapers and wire brushes. As with abrasive blasting, the degree of surface preparation for power tools or hand tools has been specified by SSPC standards. There are three standards for hand and power tool surface preparation. They are SSPC-SP 2, SSPC-SP 3, and SSPC-SP 11, power tool cleaning to bare metal.

The containment methods in part 7025.0270, include both curtains and ground cover. These are both required when power tools or hand tools are used to remove lead paint, except where the power tools are equipped with functioning vacuum recovery attachments, in which case curtains are not required. Curtains are required for hand tool removal. This language is consistent with the requirements for curtains where power tools or hand tools are used to remove lead paint from storage tank surfaces on Class II storage structures, in part 7025.0340, subpart 3, and Class III storage structures in part 7025.0350, subpart 6. However, curtains are not required where hand tools are used on ground storage tanks, because of their small height and their configuration. The difference in this requirement between bridges and ground storage tanks is due to the differences in the quantity of lead, and the potential for lead contamination between these two structures. Many bridges have a greater height above the ground than ground storage tanks. In addition, nearly all bridges have a much greater concentration of lead in paint than any storage tank, and many bridges have a greater surface area than these tanks.

Subpart 4. This subpart states that the owner or contractor who conducts dry abrasive blasting inside a totally enclosed work space shall maintain the enclosure at less-than-atmospheric air pressure during abrasive blasting by use of a dust collector with HEPA filtration of exhaust air to eliminate dust emissions; and use either a recyclable or non-recyclable abrasive, but a recyclable abrasive must be cleaned to remove nonabrasive material before it is reused. In addition, the volume of air evacuated per minute must be greater than the volume of the enclosure, and the combined volume of output per minute of all blast nozzles inside the enclosure.

If abrasive blasting is conducted in total enclosure without continuous removal of air from inside the containment then there will be a positive pressure difference compared to the ambient air. This increased air pressure derives from the blast pressure of the blast nozzle or nozzles in the enclosure. At 100 psi, from 100 cubic ft to more than 300 cubic ft of air can be added per minute inside the containment depending on the diameter of the blast nozzle. The effect of this increased air pressure is to cause air to move from inside to outside the curtains or walls. This air will carry with it both abrasive particles and particles of lead paint. The way to prevent this condition is to use one or more dust collectors to draw air out of the containment and to filter it to remove suspended particles. The requirement that the enclosure be maintained at less-than-atmospheric air pressure will ensure that the movement of air will be from outside to inside the enclosure. The amount of air that must be vacuumed in order to achieve this condition depends on the volume of the space and the pressure of the air in that space. It is reasonable to specify that negative air pressure be maintained rather than that the pressure inside and outside be equalized because particulates can be readily transported through any spaces in the enclosure if blast pressure is momentarily directed toward the containment walls. In fact, the air pressure inside the enclosure will not be uniform, but will exhibit various "microclimates" of both pressure and air velocities.

Throughout the rules HEPA filtration is specified wherever air filtration is cited. This is reasonable, because different filtrations have different removal efficiencies, and some standard is necessary if filtration is required. HEPA filtration meets a particular standard, as stated in part 7025.0210, Definitions, and different air filters on a variety of industrial equipment are now equipped with HEPA filters, including dust collectors which filter exhaust air. The purposes of the rules are served by these two conditions of negative air and filtration to eliminate dust emissions. Negative air must be achieved and maintained in the enclosure, but the air that is removed must be cleaned before it is discharged to the ambient air. Both conditions must be met and neither one alone is sufficient to achieve the purposes of the proposed rules.

Abrasive blasting in total enclosure with negative air pressure can be done with either a recyclable or non-recyclable abrasive. The advantage of using a recyclable abrasive in total containment is that nearly all of the abrasive can be collected and reused. These "hard" abrasives are such products as steel grit, iron, aluminum oxide, garnet, and silicon carbide. These materials are less friable than the non-recyclable abrasives, such as silica sand, coal slag, and staurolite mineral. Also some of them are physically harder than the expendable abrasives. Although these abrasives are more expensive, they can be used many times and therefore can provide a savings in the cost of abrasive per ft^2 of steel. Some steel grit has been used hundreds of times. Some amount of abrasive is broken down with each cycle, so that new product must be added to the blast pots at certain intervals. Additional savings can be achieved by the large reduction in volume of waste that results from the use of these materials. Both sales literature and case histories report up to a 100-fold reduction in the amount of waste that is generated compared to non-recyclable abrasive. Consequently, the costs of disposal of these wastes can be significantly reduced. As an effect of much smaller quantities of abrasive in the waste; however, the concentration of lead in the waste is greatly increased. This means that the smaller quantity of waste will most certainly have to be disposed of as a hazardous waste. On many bridges the wastes generated and collected with the use of non-recyclable abrasives are hazardous according to the TCLP test. This outcome can be changed by the use of "abrasive additives" that will render the waste non-hazardous in many cases. Whether the use of these products will continue to be approved by federal and state regulators under RCRA is not known at this time.

There are some economic incentives to use recyclable abrasives. Such cost savings will be calculated by the owner or contractor as part of the contract proposal or as part of implementation of methods and materials in the field. These considerations are offset by an effect of the use of these abrasives on the concentration of airborne lead inside the containment. Unless the abrasives are cleaned after each use, this concentration can increase significantly. Cleaning is accomplished by air washing in a size or weight classifier. It is reasonable that the proposed rule not specify the use of either recyclable or non-recyclable abrasives. However, it is also reasonable, due to concern for the health of the workers, that abrasives that are reused be properly cleaned to remove "non-abrasive material" that includes the lead paint particles that are mixed with the abrasive and that adhere to the surfaces of the abrasive grit. A number of manufacturers of dust collectors make abrasive-cleaner modules that are included in the assembly of abrasive recovery and dust collection equipment. Some of this abrasive recycling equipment can remove 99 percent of lead paint particles from the abrasive. A standard of cleanliness is not cited in the rule partly, because it would be very cumbersome to verify compliance with such a requirement. However, it is reasonable to require in general that recyclable abrasives be cleaned before reuse in order to remove the lead paint particles that would be reduced in size with each cycle, and which, with the increased number of particles in the enclosure, will greatly increase the risk to workers who remove the paint. This phenomenon is addressed by reference to the new OSHA standards, which are cited in part 7025.0220, subpart 3, Compliance with other regulations, discussed above.

The last provision of subpart 4, that the volume of air evacuated per minute must be greater than the volume of the enclosure, and the combined volume of output per minute of all blast nozzles inside the enclosure relates again to the requirement for "negative air" discussed above. If the volume of air removed from the enclosure is greater than the volume of the enclosure, added to the volume of air that is added by the blasting inside the enclosure, negative air will be achieved. The volume of air evacuated is determined by the cfm rating of the dust collector. This provision provides a simple means of ensuring that airflow will, in general, be from outside to inside the containment. This will provide minimum protection of the environment and the public health.

In itself, this language would be redundant, because of the requirement for "less-than-atmospheric" air pressure in item A. This provision, however, also relates to the need to reduce concentrations of lead inside the enclosure where workers are removing lead paint. Actual rates of ventilation necessary to protect workers health may exceed this minimum negative air requirement. It is necessary in order to prevent lead poisoning in workers who are abrasive blasting inside containment that minimum air flows be maintained. This is especially a problem in bridge maintenance, because of the very high concentrations of lead in paint on steel girders and trusses. Ventilation rates have been calculated that help to keep the levels of lead dust in the air below the protective factors of the respiratory protection equipment. In presentations on this subject at SSPC lead paint removal conferences, 100 horizontal ft per minute (fpm) or 50 vertical fpm have been cited as minimum rates of air movement. The SSPC Lead Paint Removal Guides: Suppl. to Vol. 2 (rf. 24) cites these rates of airflow "for visibility only." It adds that these rates should not be assumed to be adequate for worker protection from lead exposure. However, such rates of airflow have also been cited in recent studies, and are sometimes specified in current lead paint removal specifications in some of the eastern states.

These rates of ventilation will, in general, not be met by minimum compliance with the proposed rules. The smaller the volume of the enclosure, the smaller will be the required horizontal velocity. For example, if the height of an enclosure is 10 ft, the width is 20 ft, and the length is 30 ft, then the required volume of air evacuated per minute must be greater than 6,000 ft^3. This rate could be met with a relatively small dust collector. The airflow will be 30 horizontal ft per minute. An enclosure of 50 ft in length, if the other dimensions are constant, will require evacuation of 10,000 ft^3 and achieve an airflow of 50 fpm. Only a very large enclosure of 100 ft in length would necessitate 100 ft of horizontal air velocity. Because of the configuration of the enclosure, with air intakes on one end and air out-takes on the other end, the airflow will be equal to the length regardless of the dimensions of width and height. These numbers do not account for the effect of one or more blasters in the enclosure. However, the volumes of air added per minute by the abrasive blasting equipment are small relative to the volume of the enclosed space.

Implementing the requirements of the new OSHA regulation for lead in the construction industry, 29 CFR 1926.62, will have the effect of ensuring adequate ventilation and rate of airflow inside containment in order to prevent concentrations of lead paint particles from exceeding the protective capabilities of the respiratory equipment. As described earlier, this regulation reduced the Permissible Exposure Limit for lead in construction industries from 200 ug/m^3 to 50 ug/m^3 as a time-weighted average. There may be circumstances where abrasive blasting of a bridge is done inside total enclosure and where relatively high rates of ventilation are not necessary in order to comply with OSHA requirements. In such a case, the provision that requires that the volume of air drawn out of the containment per minute be greater than the volume of containment will ensure that negative air will be maintained inside the containment in order to protect the environment. This provision complements OSHA standards, and it also conforms to the intent of the proposed rule. The same language is used on storage tanks where lead paint is removed in modular enclosure under negative pressure in part 7025.0350, subpart 3.

Subpart 5. This subpart states that the owner or contractor who uses vacuum blasting shall use ground cover and curtains unless the owner or contractor removes all paint by holding the workhead of the vacuum blasting unit at all times against the substrate, and maintains all parts of the vacuum blasting equipment in a condition that prevents emissions of particulate matter, then the use of curtains only is not required. Furthermore, if the owner or contractor cannot maintain complete contact between the workhead and the coated surface at all times, then curtains shall be used with ground cover.

Despite its relatively low rate of production, vacuum blasting is made more feasible because there is no need of containment in those circumstances where the configuration of the steel surface and the workhead provide a good seal, where the equipment is maintained to prevent fugitive particulates, and especially where the blaster ensures good contact at all times between the workhead and the steel surface. Significant savings can be achieved in material and labor costs necessary to use curtains or enclosures. Unlike non-abrasive blasting methods, vacuum blasting, like conventional blasting, also does adequate surface preparation as it removes the paint. The most common cause of failure of this method of paint removal in terms of pollution control occurs when contact is not maintained with the steel surface. When the workhead is lifted from the surface, vacuum recovery of the abrasive and paint particles is interrupted. When this happens the vacuum blasting equipment becomes a regular blast nozzle. This increases productivity, and it also allows the worker to see the blast pattern on the coated surface that is concealed by the vacuum head that encloses the blast nozzle. Without curtains or enclosures, this practice also allows the lead paint particles to disperse downwind from the bridge. Because of these incentives to do vacuum blasting without the vacuum effect and the consequent pollution effects, it is necessary to clearly state the circumstances under which curtains are not required. As with all methods of paint removal enumerated in part 7025.0290, for Class III bridges, containment with both curtains and ground cover is required with vacuum blasting. As the rule is stated, this is the default condition. If the vacuum blasting does not cause emissions, then curtains are not required. Ground cover, however, is necessary at all times to protect the soil from incidental releases and deposits that occur as the nylon brushes or plastic or rubber sleeve is worn away. Depending on the manufacturer, it is these items that make contact with the steel surface and they must be replaced periodically as they are abraded by the rebounding abrasive particles that they confine.

The condition that all parts of the equipment be in a condition that prevents emissions of particulate matter would include replacement of the worn nylon bristle, rubber, or plastic rings, and also the use of the correct shape of this attachment to make full contact with the configuration of the steel. These include both inside and outside right angles, both perpendicular and parallel to the axis of the blast stream. In addition, the vacuum machine and the hoses must function to adequately convey the abrasive and waste materials from the surface to a container, and the exhaust air must be HEPA filtered. Both hoses and filters must not be broken or leaky.

There are situations where complete contact cannot be maintained between the workhead and the coated surface. For example, the top surface of the lower flange of an I-beam and the top of the diaphragm sometimes cannot be reached with a vacuum blasting unit. Also the sides of nuts and bolts will not be adequately abraded by putting the workhead over them. Lastly, some bridge beams are too closely spaced to allow the use of proper perpendicular orientation of the vacuum workhead on the flat surfaces of the webs or fascia. In each of these cases effective vacuum recovery at the workhead would not be achieved. At this time vacuum blasting would not be feasible for complete paint removal from the trusses of a bridge. It is most effective on large flat steel surfaces. On a particular project these surfaces may be vacuum abrasive blasted without curtains. Curtains may then be deployed to contain the inaccessible angled parts of the bridge before either "vacuum" blasting these areas or using another method of paint removal under this part.

Part 7025.0300, Class IV bridge

This part states that an owner or contractor who removes lead paint from a Class IV bridge or bridge portion shall use the methods required in parts 7025.0270 and 7025.0280 as minimum pollution control, and a method of paint removal required in part 7025.0290. A bridge or bridge portion is Class IV if it is within the distance standards of residential, child care, school, playground, public use, commercial, industrial, agricultural, or protected natural area property, and it is also in proximity to a water body. The distance standards are stated in part 7025.0250, Classification of bridges. A Class IV bridge, because of the distance to these properties, combines the requirements of the other three bridge classes. It is reasonable to refer to the containment methods in part 7025.0270, which can be used to protect the land surfaces under the approaches of a Class I or Class II bridge, as well as the containment methods in part 7025.0280, that prevent lead contamination of the water body beneath or in proximity to a Class II bridge. These methods of containment must be used in conjunction with the methods of paint removal that are cited in part 7025.0290, for Class III bridges. These four methods, which are addressed in subparts 2 through 5 above, are generally less "contaminating" than conventional dry abrasive blasting with curtains and ground cover alone, and with neither total enclosure nor a dust collector of sufficient capacity to provide negative air. Dry abrasive blasting is the removal method of Class I and II bridges.

Rather than reiterate pollution control requirements in this part, the owner or contractor can refer to the previous provisions, which are cited here, to address the pollution control necessary to remove lead paint from a Class IV bridge. The economy of language of the rule is greatly improved by this construction. In like manner, the statement of the reasonableness of part 7025.0300, of the rule has been set forth in the treatment of parts 7025.0270 to 7025.0290 above. The provisions for protecting the environment in this rule are strictly additive; there are not synergistic effects that would require either more or less protection for these structures. Neither is additional discussion of part 7025.0300, necessary to supplement what has already been said with regard to the reasonableness of the previous parts.

7025.0310, Classification of storage structures

Subpart 1. This subpart states that the classifications in this part shall be used to determine the requirements in parts 7025.0320 to 7025.0350, that apply to a storage structure from which lead paint will be removed. Further, the owner or contractor shall determine the class of each storage structure or structures from which more than 200 square ft of lead paint will be removed at one location during one year. Each storage structure from which lead paint will be removed will be classified in one of three classes. The classes referred to here are classes of pollution control. The storage structure is designated to a class according to the factors specified and defined in subpart 2 and for which standards are established in the table in subpart 3. As with bridges, the class of a storage structure establishes the pollution control requirements that are described in subsequent parts of the rule.

It is reasonable that class only be determined for that structure or those structures from which lead paint will be removed from a total surface area greater than 200 ft^2 at one place in one year. These will consist of complete paint removal on relatively small structures or partial paint removal (or spot repair) on larger structures. The purpose of the different classes is to apply more pollution control to those structures that have the most lead paint on them that are sited in the most sensitive areas. The variables that are used to determine Class I, II, or III, specifically height and surface area, vary significantly among large structures, but they are less important for small structures. It is also a matter of proportion, that is, to remove a relatively small amount of lead paint should not require calculations appropriate for assessing the potential effects of removing large amounts of lead paint. Although high concentrations of lead may be present in the paint that is removed, it would be unreasonable to require classification to be determined for small storage structures or for small amounts of paint removal from large structures. These structures will always have a RF smaller than 100. They would, therefore, always be Class I or Class II structures according to the table in subpart 3. Neither is it reasonable, because of the relatively small amount of paint removed, to apply the standards of distance to receptor properties from the table in subpart 3.

The methods of paint removal and containment are specified in the different classes of pollution control in parts 7025.0330 to 7025.0350. Because of the exemption from classification, it is necessary to address how lead paint can be removed from surface areas of less than 200 ft^2. This language is found in part 7025.0320, Pollution control required, which says that the owner or contractor may use any of the methods cited for storage structures.

Subpart 2. This subpart states that the class of pollution control necessary for lead paint removal from the storage structure is provided by the table in subpart 3. The factors that determine the class of a storage structure are described in this subpart. The class of pollution control is determined by the designated use of receptor properties, the distance to receptor properties, and a factor of potential risk for paint removal from the structure. These different terms are described in items A to D of this subpart.

Item A. This item states that "receptor properties" are properties that are designated by their use and ranked by sensitivity to lead contamination in three groups "A," "B," and "C." These properties include residential, child care, playground, and school property in group A; protected natural area, public use area, and commercial property in group B; and industrial and agricultural property in group C. These properties appear as headings to the columns in the table in subpart 3. This item further states that receptor properties for structures on group A and B property include the property on which the structure is located and also neighboring properties. This means that for steel structures sited on those properties listed in groups A and B, above, the applicable receptor property includes both the property itself and also any neighboring properties. For structures on group C properties, that is industrial and agricultural property, receptor properties include only neighboring properties.

Except for commercial, industrial, and agricultural property, these properties are defined in part 7025.0210, Definitions. The meaning of these three terms is deemed to be understood without ambiguity. These are termed "receptor" properties to convey the idea that they can "receive" lead paint particle deposition. This occurs where such properties are not protected from contamination by the use of pollution control when lead paint is removed from storage tanks. Group A is the most sensitive property group, group B is intermediate, and group C is the least sensitive to the effects of lead contamination. These same properties and property groupings are used in the classification of bridges in part 7025.0250. Although the pollution control class of storage tanks is determined by more variables than that for bridges, these properties are similar in the characteristics that result in one property being more sensitive to the effects of lead paint contamination than another, or sharing the same relative sensitivity with another. This sensitivity is independent of the steel structure. The discussion of the appropriateness of this classification scheme for bridges is germane also to storage tanks.

These nine different properties are apportioned into three groups for both bridges and storage tanks. If one believes that it is better to have a more simple rule than one that is more complex, then it is desirable to have a smaller number of property groups and of pollution control classes. The reasonable consideration is whether or not the differences and similarities among the properties, in terms of susceptibility to and effects of lead contamination, make the groups logical due to the nature of the properties that comprise them. These different properties share features such as use or occupancy by children, or reduced likelihood of exposure of children, or the non-worker public to lead paint particles. It would be difficult at this time to rank each of these different properties with different protective factors. To do so would also exceed the level of detail and complexity of these rules.

One could also further qualify and subdivide each of these properties, whether it be a school, a commercial property, or an industrial facility, according to a number of factors such as the likelihood and duration of presence of children, the number of adults that frequent the stores, the existing lead contamination of the industrial property, etc. This would greatly increase the complexity of the rule. "Lumping" and "splitting" are the essence of rulewriting and it affects all parts of this rule. One should make distinctions ("split") where such distinctions serve the purposes of the rule and one should not make distinctions ("lump") where such distinctions are not appropriate for these purposes. In considering the level of detail of the rule, one must also consider how the provisions of the rules would be implemented by the regulated industry and by the MPCA.

The distinction between groups A, B, and group C in what is considered to be receptor property is reasonable, because it allows less restrictive pollution control to be used where it is most appropriate, that is, on those properties that are least sensitive to the effects of lead contamination. Several examples will illustrate the reasons for this distinction. Removal of lead paint from a fuel tank on a tank farm where the tank is sited more than 100 ft from neighboring industrial property could be done with Class I pollution control (if the RF is less than 300). This situation would likely be the case where the tank was located within the tank farm. If, however, another industry was located across the road and within 100 ft of the fuel tank, then either Class II or III pollution control would be necessary. This circumstance would likely occur where the tank was near the property line of the tank owner. A similar situation could be described for a steel structure sited on agricultural land, such as transmission or water towers.

By contrast, removal of lead paint from an above-ground pipeline or pumping station on a national wildlife refuge, because this is a protected natural area (group B), must consider the refuge to be receptor property as well as any neighboring property. The distance standard for group B properties is 200 ft. The practical effect is that the structure would require Class II or III, and not Class I, pollution control. A similar situation could be described for a water tower located on any group A or B property. Basically, industrial areas and cultivated land are not considered receptor property when they contain a steel structure from which lead paint is removed. In this case, only the nearest neighbors are evaluated for their designated use and for their distance to the structure. Structures sited on all other properties require evaluation of both that property and neighboring properties. They are all considered to be receptor properties. The determination of distance is further addressed below in item B.

Item B. This item states that "distance (ft)" is the measure of distance in ft from the base of the steel structure to the receptor property line and that the values in the table in subpart 3 are the standards of distance for the designated properties. "Distance" appears as a row heading in the table in subpart 3. This item further states that if the structure is located on a property listed in item A, that property is considered a receptor property, and the distance for that property is zero ft, except for group C properties.

As stated above, the same designated properties are used for bridges as for storage tanks and they are grouped in the same way. The same numerical standards of distance are also used for each of these property groups in the classification of bridges in part 7025.0250. The classes of pollution control for bridges depend wholly on distance to the different properties, whereas with storage tanks the calculation of a "risk factor" is also used. The standards of distance 100, 200, and 300 feet, are numbers that increase by whole factors and that are rounded to hundreds of feet. They are also applied uniformly to a number of different properties within a group. In terms of sensitivity to lead contamination, the similarities between properties within the different groups are greater than the differences between them. This results in the establishment of three discrete groups A, B, and C, that are more different from each other than they are alike. Different standards of distance are associated with each of these groups. These different standards are used to establish different classes of pollution control that express the differences among the groups of receptor properties.

The use of these distance standards implies that areas within 300 feet can be affected by lead contaminated material generated during paint removal from steel storage structures. This is indeed the case as stated in the discussion of the 'Statement of Need' above. The most sensitive properties are accorded the most protective distance standard (300 ft); the less sensitive, a less protective standard (200 ft); and the least sensitive, the least protective standard (100 ft). The rule is reasonable in its intent to be conservative in the manner in which it protects the environment and the public health, and at the same time to be proportionate in requiring the most pollution control where the most serious pollution can occur. The greatest protective factors are accorded those properties that would incur the worst effects of lead contamination, and the most rigorous pollution control methods are required on those structures that present the greatest risk of causing lead contamination. This modulated response is based on both the location of the structure relative to the surrounding properties, and on the characteristics of the structure itself. For storage tanks, this is manifest in the use of both standards of distance and standards of RF.

The statements made regarding the benefit in making and keeping simple those parts of a rule that do not compromise the content and effect of the rule, in the discussion of receptor properties in item A above, apply here as well. In addition, it would be difficult to determine more "exact" numbers at this time. Using the two criteria of conservative protection and proportionality these numbers are more reasonable both in their magnitude and progression than any others. The use of round numbers as threshold values in regulations is commonplace.

Examples are prohibitions on logging within 100 feet of a stream on federal lands in the mountains of the Pacific Northwest, and the demolition and renovation standards in the federal National Emission Standard for Asbestos of 80 linear meters (260 linear feet) or 15 square meters (160 square feet) surface area. Speed limits on streets and highways are set in increments of 5 or 10 miles per hour. All standards that are absolute numbers have a general applicability that cannot be achieved with case-by-case threshold numbers. Such general standards should be selected to protect or prevent in "worst case" situations rather than for either average or less serious circumstances.

The distinction between the receptor properties in groups A, B, and C complements the language in item A above. In item A receptor properties are defined to include both the property on which the structure is located as well as neighboring properties, except for industrial and agricultural property (group C). The distance in the table in subpart 3 is the distance from the base of the structure to the property line of the receptor property. To apply the distinction made between the groups of properties means that structures on group A or B properties should use a distance of zero feet for that property. Doing so will remove any ambiguity in the designation of the owner property immediately surrounding the structure and it will encourage the correct use of the table to determine the class of pollution control.

Item C. This item states that "risk factor" is the calculation of potential risk for the steel structure, and that the values in the table are the standards of RF for the designated properties. "Risk factor" appears as a row heading in the table in subpart 3. The calculation of RF is the product of three variables: (1) concentration of total lead in the exterior coatings of the steel structure, expressed in percent as a decimal; (2) height of steel structure divided by 10 and raised to the 1.4 power, expressed in feet (ft); and (3) total exterior surface area of steel structure from which paint will be removed, expressed in thousands of square feet (ft^2) such that:

$$RF = \text{conc. Pb } (\%) \times \left(\frac{\text{height}}{10}\right)^{1.4} (\text{ft}) \times \frac{\text{surface area}}{1000} (\text{ft}^2)$$

Item D. This item states that "class" is the class of pollution control required for the steel structure as determined by the standards of RF and distance and by the property use designation.

These factors have been discussed above. The class of an individual storage structure is provided by the table in subpart 3. Each structure will have one distance to each of the nearest receptor properties, and one RF, and one class of pollution control. The class of pollution control for the structure is the highest class determined by the RF, and the distance to receptor property, with class III being the highest class.

Subpart 3. This subpart provides a table of the required class of pollution control for storage structures.

Receptor Property

Residential, Child Care, Playground, or School Property (A)

Risk Factor (RF)	< 100	> 100	> 100
	and	or	and
Distance (ft)	> 300	< 300	< 300
Class	I	II	III

Protected Natural Area, or Public Use Area, or Commercial Property (B)

Risk Factor (RF)	< 200	> 200	> 200
	and	or	and
Distance (ft)	> 200	< 200	< 200
Class	I	II	III

Industrial or Agricultural Property (C)

Risk Factor (RF)	< 300	> 300	> 300
	and	or	and
Distance (ft)	> 100	< 100	< 100
Class	I	II	III

The classification of storage structures in this part and the application of these classes to parts 7025.0320 to 7025.0350, constitute the conditions for lead paint removal from storage structures. The provisions of the proposed rule provide a reasonable means to address the issue of lead paint removal from these structures. The proposed rule would be shorter and more simple if all storage tanks were treated the same, regardless of their location or neighboring property. For example, the rule might prohibit the use of dry abrasive blasting of all tanks with lead paint, or it might require the use of total enclosure with negative air on each structure. Such provisions, although they might achieve less pollution overall than the requirements presented here, would do so only at great additional expense to the owners. Instead, this rule proposes minimum pollution control on all storage structures, and additional pollution control according to the perceived risk posed by the individual structure. The risk of the effects of lead contamination to the neighboring properties varies according to the designated use of the property, and also with the structure itself, specifically its size, its height, and the concentration of lead in the paint. The purpose of this rule, as it concerns maintenance of storage structures, is to protect the environment and to provide additional protection to those properties that, by their designated use, would be more sensitive to the effects of lead contamination.

In contrast to bridges there is great variation in the concentration of lead in paint on different storage tanks. On elevated water tanks total lead levels can range from less than 0.5 percent by weight to more than 37 percent by weight. Such variation means that two different tanks with the same surface area can differ by a factor of 50 to 100 in the amount of lead on the exterior surface. Similarly, the size measured in surface area can be very different from one tank to another according to the storage capacity. A 1,000,000 gal elevated multileg tank can be five or six times larger in outside surface area than a multileg tank of 50,000 gal capacity. Similar factors of increase apply to pedestal column elevated tanks. A 2,000,000 gal fluted column tank can have more than 20 times the surface area of the smallest pedestal column tank. These comparisons are between water towers only. Similar differences in size can be shown among fuel storage tanks.

Both the concentrations of lead in paint and the amount of paint on the surface of storage tanks can vary greatly. These two factors determine the amount of lead that can be present on one of these structures. The product of these factors, considered together, can result in 500 to 1,000-fold differences in quantities of lead paint on storage tanks. These two factors of lead concentration and surface area are used to calculate the potential RF that determines the class of pollution control for a storage structure. It is evident that it would be unreasonable, given this variation, either to not account for these variables, or to have only one standard of pollution control for all storage structures.

In addition to lead concentration and surface area, height also is an important variable that determines the potential distance of dispersal of paint particles released when the paint is removed from the structure. Ground storage tanks, whether water or fuel reservoirs, can be 20 or 50 feet high. Elevated water tanks can be 200 feet high. The distance of dispersal is a function of the height of release and also of the windspeed. The Bareford and Record study (rf. 4), which was conducted on a bridge, is germane also to removal of lead paint by abrasive blasting of storage structures.

Part 7025.0320, Pollution control required

This part states that an owner or contractor who removes lead paint from the exterior surface of a steel water tank, fuel tank, grain storage bin, or other steel storage structure shall use the paint removal and containment methods required in parts 7025.0320 to 7025.0350, except that paint removal conducted only for the purpose of coatings analysis is exempt. This part assists the owner or contractor to quickly find the parts of the proposed rules that apply to removal of lead paint from the exterior surface of a storage structure. These methods are apportioned in the rule according to the class of storage structure. The classes of pollution control are established to prevent the effects of lead contamination on public health and the environment, with the most restrictive class applied to the greatest potential risk. In addition, this statement, similar to a statement of applicability, requires compliance with the relevant parts of the rule and serves to reinforce its effect. The exemption for paint removal for paint sample analysis is the same as that for bridges stated in part 7025.0260. It is provided for the same reasons stated for bridges.

This part further states that if lead paint is removed from a total surface area less than 200 square feet on one or more structures at one location in one year, the owner or contractor may apply any method in parts 7025.0330 to 7025.0350. This provision for removal of less than 200

ft^2 of lead paint is reasonable for the same reasons given to address the exemption in part 7025.0310, subpart 1. That subpart exempted removal of lead paint from a total surface area less than 200 ft^2 from classification of storage structures. The language of part 7025.0320, supplements that exemption by addressing what methods of paint removal and containment are acceptable for removal of paint from these relatively small surface areas. According to part 7025.0310, relatively small structures or small areas of paint removal do not have to be classified. It is reasonable that any of the nine methods of paint removal and containment cited for Classes I, II, and III be applied to these relatively small surface areas. As stated earlier, there would be relatively little difference among those structures from which relatively small amounts of paint are removed, in either the calculation used to determine potential risk, or in the effect of the location of the structure relative to neighboring property. Because of this, it is reasonable and appropriate to allow any of the pollution control methods to be used for storage structures that are relatively small, or for those larger structures from which relatively small areas of paint will be removed.

Certain storage structures can be small in surface area. In this they are unlike bridges, but they can be similar to "other steel structures" in part 7025.0360, some of which may also be relatively small in surface area. The lead paint removal requirements for "other steel structures" in part 7025.0370, do not require classification of the structure and they allow the use of any of the methods cited for storage structures. Although small areas of paint may be removed from a bridge, there are no "small" bridges. Also, those bridges that have lead paint on them generally have very high concentrations of lead in paint. For these reasons, removal of a minimal amount of lead paint from a bridge is not exempted from the use of pollution control classes.

This part further states that an owner or contractor who uses dry abrasive blasting for surface preparation after removing all lead paint with any other method shall use the containment methods required in part 7025.0330, subparts 2 and 4. Subpart 2 specifies curtains and subpart 4 specifies ground cover. However, the use of curtains is not required if (A) a low-dust nonsilica abrasive is used; (B) the structure is in proximity only to receptor properties B and C in the table in part 7025.0310, subpart 3, and

$$\frac{\text{height of structure (ft)} \times \text{surface area structure (ft}^2\text{)}}{5{,}000} < 10$$

or the structure is in proximity only to receptor properties C; and (C) particulate matter does not cross the owner's property line.

This provision regarding pollution control during secondary abrasive blasting applies primarily to Class II and Class III structures, and specifically to those methods of paint removal that do not simultaneously either remove all corrosion or abrade the steel surface as they remove lead paint. These include some power and hand tools and chemical stripping. In addition, dry abrasive blasting may be necessary for rust removal after wet abrasive blasting. Dry abrasive blasting is the default method of paint removal for Class I storage structures in part 7025.0330, subpart 1.

The provision that addresses abrasive blasting following removal of lead paint in this part is similar to that for bridges in part 7025.0260. The reasons for this provision are the same as those given for bridges on pages 36 to 40. Although lead paint is not removed by this phase of maintenance recoating, this abrasive blasting is an integral part of the process of repainting steel structures. Lead paint is not removed from steel surfaces without repainting, and surface preparation is necessary for repainting. This provision addresses how secondary abrasive blasting relates to existing state air quality rules. As stated in the treatment of bridges, the proposed rules will supersede the fugitive dust rule (Minn. Rules pt. 7011.0150), and the visible emissions rule (Minn. Rules pt. 7011.0110) as they apply to aspects of removing lead paint. These rules would still apply to abrasive blasting of paint with less than 0.5 percent total lead, and to other abrasive blasting activity.

A difference between the provision for bridges and for storage structures is that the factors used in the RF index for storage tanks are used in the calculation in part 7025.0320. These are the height and the total surface area of the structure. These determine how much particulate may be generated and how far it may disperse. The concentration of lead in paint is not a part of this index, because this paint has already been removed. For bridges there is no RF index, and height is not a factor. Instead an absolute surface area of 1,000 ft^2 is used with the location of the bridge and the proximity of certain properties.

This simple calculation applies to structures in proximity to receptor properties B. It gives equal value to the height of the storage structure and the surface area. The product of these two factors (in feet) is then divided by 5,000 and compared to the number 10. Any product of height and surface area that is smaller than 50,000 does not require the use of curtains during secondary abrasive blasting with a low-dust nonsilica abrasive. As an example, a large bulk fuel storage tank with a flat roof that has a height of 50 ft and a diameter of 100 ft will have a total exterior surface area (including shell and roof) of about 24,000 ft^2. The quotient of this product is 120. Because this is larger than 10, both curtains and ground cover would be necessary during secondary abrasive blasting of this tank, if it was within 200 ft of receptor properties B, that is, protected natural areas, public use areas, or commercial property. On the other hand, partial or "spot" repair of this structure that involved the removal of lead paint and surface preparation of less than one-sixth of the total surface area would not require the use of curtains. A smaller tank at this same location with a surface area less than 5,000 ft^2 and a height of 10 ft would also not require the use of curtains during secondary abrasive blasting.

This calculation only affects structures that are in proximity to those properties designated in group B. If these tanks were within 300 ft of receptor properties A, containment would have to be used, whereas curtains would not be required within 100 ft of receptor properties C. Curtains are always necessary during secondary abrasive blasting regardless of height or size of structure for residential, child care, and school building property (A), and they are not required for industrial or agricultural property (C). However, because of the requirement that particulate matter not cross the owner's property line, it may be necessary to use curtains when blasting is done on any of these structures. This would depend in large part on the existing windspeed and wind direction.

The methods of paint removal cited in the proposed rules for storage structures that will remove paint, but will not provide a surface profile or remove all corrosion, are power tools or hand tools and chemical stripping. Chemical stripping is not cited in the bridge provisions. Other methods like wet abrasive blasting and dry ice blasting are done with curtains in place, so the use of curtains during dry abrasive blasting does not incur additional material expense. This provision is treated further in the discussion of these different methods of removal in parts 7025.0340 and 7025.0350.

Part 7025.0330, Class I storage structure

Subpart 1. This subpart states that an owner or contractor who removes lead paint from a storage structure that requires Class I pollution control shall use the methods in this part as minimum pollution control for dry abrasive blasting, or the owner or contractor shall use a method of removal and containment in part 7025.0340 or 7025.0350. Abrasive blasting without the use of water is the most commonly used method to remove coatings from steel structures. Of the different methods available, it has the highest productivity, which in many circumstances has made it the least costly means of repainting exterior steel. Unlike other methods, abrasive blasting both removes existing coatings and corrosion and provides for good adhesion of the new coatings by abrading the steel surface. As discussed above in the treatment of paint removal from bridges, abrasive blasting generates a lot of small size particulate matter, and without adequate containment, can cause very significant lead contamination over large areas.

An owner or contractor who removes lead paint from a Class I storage structure will, in most cases, use dry abrasive blasting because of economics and past practice. However, because of pollution control requirements in this part or because of concern regarding lead contamination, other methods may also be considered. The methods of removal and containment specified in parts 7025.0340 and 7025.0350 for Class II and Class III structures, respectively, can also be applied to Class I storage structures. These methods are less contaminating, either because they do not release small particulates, or because of enhanced containment efficiency. The economy of language of the rule is improved by this formal construction where methods of removal or containment of a more restrictive class can be applied to a less restrictive class. These provisions are referenced rather than repeated. Similarly, the containment requirements of a less restrictive class are referenced as minimum requirements in the more restrictive classes without repetition. This is done in the conditions for lead paint removal for bridges, as well as for storage structures, and other steel structures.

Subpart 2. This subpart states that the owner or contractor shall suspend a curtain throughout paint removal on the upwind side and the downwind side of the structure, except as provided in item B, in a manner that effectively prevents the dispersal of paint particles. The curtains shall be rated by the manufacturer at not less than 100 percent impermeable. Just as part 7025.0270, described the minimum pollution control necessary for lead paint removal from bridges, part 7025.0330, describes the minimum pollution control necessary for lead paint removal from storage structures. Basically, where dry abrasive blasting is done, this consists of curtains and ground cover. Class I pollution control is similar for storage structures and for bridges.

The recommendations of 1990 (exh. 6) cited the use of a single curtain on the downwind side of a water tower for dry abrasive blasting. Other methods of removal were recommended where concentrations of lead in paint exceeded either 5 percent or 1 percent and where towers were sited within certain distances of certain properties. This single curtain would act as a barrier to the dispersal of lead paint particles. However, such containment for dry abrasive blasting in the dimensions prescribed, is generally not adequate to prevent significant contamination. The proposed rules require the use of both upwind and downwind curtains. The upwind curtain acts as a windbreak slowing the velocity of air movement inside the curtain while the downwind curtain acts as a physical barrier to particle transport and as a second windbreak. In combination, because of the nonlinear effect of air velocity on particle dispersal, these two curtains will have a greater effect than that of two individual curtains added together. The particles that do go around or under or over the downwind curtain will be slowed by reduced wind velocity. These particles will then be more likely to deposit on the ground cover extended downwind of the structure as described in subpart 4.

Because these structures are Class I, that is, both the calculated RFs and the distance to receptor properties are below the standards in the table in part 7025.0310, subpart 3, these structures pose the least potential for lead contamination and the least harmful effects of this contamination. These structures are either relatively small in surface area or they have relatively low concentrations of lead in the paint or both. In addition, they are not in proximity to sensitive receptor properties. Because of the Class I designation of these structure, the use of partial containment with suspended curtains, with the windspeed limitation and the cleanup requirement, is deemed to be adequate to prevent significant contamination. It would not be reasonable at this time, because of the significant added costs, to require either more restrictive pollution control for these structures (e.g., total containment), or paint removal methods with reduced productivity.

Wind loading on downwind curtains attached to water towers has caused concern for the structural integrity of the tank. On elevated tanks, the curtain suspended on the upwind side of the tank will be blown against the tank itself. This adds little wind loading to the tower, and because of reduced windspeed, will reduce the loading caused by the downwind curtain. The windspeed limitation in subpart 5 prohibits blasting in conditions that would cause wind loading. Ordinarily curtains would be either lowered to the ground or furled when windspeeds increase. In any case, these fabrics would probably be torn before they cause any structural damage to the water tower. The weight of the containment alone is much less than the water that would be stored in the tank. Item B, which addresses the use of curtains on ground storage tanks, allows the use of a single downwind curtain due to the unique configuration or size of these tanks.

The curtains used on these storage tanks must be 100 percent impermeable. This is a standard rating of containment screen manufacturers. This is the same requirement for curtains on Class I and Class II bridges. In the recommendations of 1990, "small mesh" material was allowed for bridge curtains and permeability was not specified for water tower containment. Impermeable curtains will act as more effective wind breaks and as more effective barriers to particle dispersal than fine-mesh fabrics. In addition, although impermeable fabrics offer more wind resistance than small mesh material, some of them are also significantly stronger with greater burst strength. This can render a big cost savings in capital expense where sudden wind gusts can tear curtains before they can be lowered.

Item A. This item states that if the structure is a water tower, standpipe, or a grain storage bin, the length of each curtain must be greater than two-thirds the height of the structure, and the width of each curtain must be greater than the largest diameter of the structure. Further, the curtains shall be moved so that the point of paint removal shall always be at least ten feet inside a vertical edge of a curtain and ten feet below the upper edge of a curtain, except where paint removal is conducted beneath curtains attached along their upper edge to the wall of the structure.

There are two conditions that determine how well pollution control used during abrasive blasting actually contains the particulate emissions that are generated. One is the dimensions of the containment, and the second is how and where that containment is actually used. This latter consideration applies in particular to Class I storage structures where the minimum surface area of containment is less than the total surface area of the structure itself. Therefore it is necessary and reasonable that the curtains be positioned according to the wind direction and that they be moved to always cover the area of paint removal. This requirement complements the general requirement in subpart 2 that the curtains be used "...in a manner that effectively prevents the dispersal of paint particles."

The dimensions of curtains specified here are similar to those found in the recommendations of 1990. Because of their Class I classification it is not required that these curtains reach the ground or that they be anchored. The windspeed limitation in subpart 5 addresses corrections that may be necessary to the containment system, or the removal method to address environmental contamination. Because the diameter of different components of a storage tank can vary, it is reasonable and necessary to specify the "largest diameter" of the structure. Hydropillars and especially single-column pedestals have columns whose diameters are significantly smaller than the reservoirs themselves. A curtain that was equal in width to the diameter of the column only would have little effect in preventing dispersal of lead paint particles during abrasive blasting of a single-column pedestal, and especially of its reservoir.

A curtain with a width equal to the diameter of a storage tank will cover 114.6 degrees of the circumference of the reservoir. The upwind and downwind curtains together will cover nearly 230 degrees of arc, leaving 130 degrees of the circumference unconfined. A little more than one third of the tank circumference would be uncurtained. This area would be increased somewhat when paint removal occurs on the reservoir of a water tower, or on all parts of the exterior of a standpipe or a grain storage bin, because to "effectively prevent the dispersal of paint particles," one or both curtains would have to be separated from the steel surface and this would reduce the ratio of the width of the curtains to the circumference of the tank. If the owner or contractor is blasting on either an upwind surface or a downwind surface, the blaster obviously must work between the curtain and the steel surface. For the downwind curtain to have any effect in containing the emissions of abrasive blasting of either an upwind surface or a crosswind surface, it must be separated along its width from the steel surface so that air movement carries the particles inside the curve of the curtain and not past the curtain edge to the ambient air. The only time it would not be necessary to hold the curtains out from these structures is when abrasive blasting occurs on the center column or the legs of a water tower where the two curtains, suspended on the outside of the bowl, would be adequately removed from the point of paint removal to be able to contain the paint particles. Otherwise, adequate space must always be maintained between the downwind curtain and the structure itself during removal from any part of the tank to "effectively prevent the dispersal of paint particles."

Many multileg towers have a balcony or "catwalk" around the equator of the reservoir. If containment is either attached to the balcony or suspended above the balcony, this feature can provide the space necessary between the steel surface and the curtain to capture many of the emissions generated from points on the downwind side of the tank and from points on the upwind surface as well as on a surface perpendicular to the direction of the wind. In addition, depending on its point of attachment, low windspeeds will move the downwind curtain out from any of these structures regardless of its configuration. A curtain used on an elevated tank that has a length two-thirds the height of the tank will, because of its weight, resist the effect of low windspeeds that would blow the bottom edge at a large angle away from vertical allowing the escape of large amounts of particulate. These curtains can also be attached to the ground.

As the curtains are raised or lowered to confine the area of paint removal, a minimum of one-third of the height of the structure would not be confined by curtains at any one time. Because of the requirement that the point of paint removal always be inside the curtain edges, this portion of the tank would only be exposed either before or after it had been abrasive blasted. This condition, that the point of paint removal always be at least ten feet inside a vertical edge and the upper edge of a curtain, addresses the "how and where" containment is used which was introduced above. The language of subpart 2 says that the owner or contractor shall suspend a curtain on both "the upwind side and downwind side" of the structure. At any one time, a storage tank can be divided longitudinally into two equal halves, an upwind side and a downwind side. As a curtain is moved around the tank to maintain a ten feet distance between the point of paint removal and the vertical edge of the curtain, the curtain will come to the opposite "hemisphere." At this point the second curtain would be moved so that it was at least 10 feet beyond the point of paint removal in order to confine the abrasive blasting. For example, assuming constant wind direction, paint removal conducted on the upwind side of the bowl or reservoir of a water tower would be confined by the upwind curtain. As abrasive blasting moved laterally into the crosswind areas, this curtain would be moved as necessary to maintain the 10 foot confinement distance. Eventually, as paint removal continued on portions of the tank perpendicular to the wind direction, the downwind zone would be met and the downwind curtain would be used as a screen. If wind direction shifts, it may be necessary to move the two curtains in order to keep them on upwind and downwind sides of the structure. Also, wind direction changes may require that the opposite curtain be used either sooner or later than in the example given above.

Owners or contractors responsible for repainting small stationary tanks may elect to surround the tank with curtains rather than to use the minimum curtain widths prescribed here. This would mean that this containment would not have to be moved according to wind direction, or in order to keep the point of paint removal 10 feet within the curtain edge. On large tanks, such as municipal water towers and large fuel storage tanks, curtains are raised and lowered each day during paint removal. On very large tanks, this means that no lateral movement of curtains would be necessary during the day, except for significant changes in wind direction. The upwind or downwind curtain could be positioned with a vertical edge 10 feet past the initial point of blasting so that the day's paint removal would be done beneath the curtain and at least 10 feet from either edge.

Item B. This item states that if the structure is a ground storage tank, the length of each curtain must be greater than the height of the tank, and the width of each curtain must be greater than the diameter or the length of the tank. The owner or contractor may suspend a curtain only on the downwind side of the tank, but the width of this curtain must be greater than the length of the tank or than half the circumference of the tank.

Ground storage tanks are storage tanks that have a height above the ground less than 20 feet, or a diameter greater than or equal to the height, or a length greater than the height, according to the definition in part 7025.0210, subpart 8. These particular attributes have consequences for the potential for contamination due to abrasive blasting of these structures. Because these tanks are not elevated, it is easier to use full length curtains that extend the height of the tank. It can be difficult to use curtains on Class I elevated tanks that may be 150 to 200 feet tall, and because of their greater size and weight, it can be very difficult to use full length curtains on these tanks. For this reason, in item A the minimum curtain length was only two-thirds the tank height. It is reasonable to require full length containment on ground storage tanks, because it is feasible to do so at little additional cost of material and very little extra labor, compared to shorter curtains.

The configuration of the ground storage tank, with a diameter greater than or equal to its height in the case of either cylinder tanks or "ball" tanks, or a length greater than the height in the case of "bullet" tanks, means that these structures act as their own containment. Cylinder tanks are standard bulk fuel (or flat-bottomed) tanks on tank farms and "bullet" tanks are standard liquid propane (LP) tanks. The function of the upwind curtain in pollution control is to act as a windbreak. Because these tanks are generally wider than they are high abrasive blasting done on the downwind side of the tank will be somewhat blocked from the effects of the wind. Because of the smaller height of these tanks particles released by blasting on the upwind side, would disperse to shorter distances than from structures that are not ground storage tanks. Lastly, many of the tanks in this group will be sited on tank farms where neighboring tanks will act as wind breaks. For these reasons it is not reasonable to require curtains on the upwind side of these tanks. The additional benefit that would derive from their use is not large enough to justify the additional costs in labor and material. Unlike the requirement for greater length of the downwind curtain, a small difference only in material, to use or not use an upwind curtain could mean a big difference in both material and labor. The reason for the greater width of the downwind curtain (half the circumference of the tank), if an upwind curtain is not used, is the same as for the greater length of the downwind curtain. It provides greater environmental protection with reduced containment, but with little additional cost of labor or material.

Where an upwind curtain is not used, it is especially important that the downwind curtain be deployed "..in a manner that effectively prevents the dispersal of paint particles." This means that the vertical edges of this containment must be positioned out from the body of the tank in order to stop the dispersal of emissions from blasting the upwind and the crosswind surfaces of the tank, as described above in item A. On ground storage tanks it is not required that the curtains be moved so that paint removal is always inside the curtain edges. Again, there are fewer restrictions on these structures, because of the factors enumerated above in the treatment of exempting the upwind curtain requirement. This also is one of the lesser requirements.

Subpart 3. This subpart states that the owner or contractor shall remove paint from any surface above the curtains with wet abrasive blasting, power tools or hand tools, vacuum blasting, or chemical stripping, except that dry abrasive blasting may be used if the surface is enclosed. If dry abrasive blasting is used for surface preparation following paint removal, the use of enclosure is not required with the conditions in part 7025.0320, items A, B, and C. These items are those that allow the exemption of curtains where secondary abrasive blasting is done on the steel surface after lead paint has been removed by another method, such as power tools or chemical stripping. These conditions specify a low-dust nonsilica abrasive (item A), the index of height and surface area of preparation for receptor properties B (item B), and dispersal of particulate matter restricted to the owner's property (item C).

In subpart 2, it is required that curtains be used on two sides of Class I storage structures, except ground storage tanks. The length and width of this containment is specified as discussed in the treatment of subpart 2 provisions above. However, there is not a requirement to suspend or enclose the entire structure with containment or to enclose the top surface. For this reason it is necessary to address requirements for removal of lead paint from these surfaces. As stated in subpart 2, item A, any abrasive blasting on water towers, standpipes, or grain storage bins must be done at least 10 feet from the vertical or top edge of the curtain, except where done beneath the point of attachment of the curtain. The owner or contractor must determine at what height to attach or suspend the curtains in order to remove paint from the upper portions of the structure. This will depend largely on the height and the configuration of the structure which, in turn, will determine the practicality and the costs that derive from the proportion of contained and uncontained surface areas. Generally, curtains will be suspended from the upper portion of the structure itself. This would not be the case if cranes or support columns are used to hold the curtains a minimum of 10 feet above the top of these steel structures. This subpart addresses removal of paint from those surfaces above the reach of the curtains regardless of how they are held in place.

One of the options in subpart 3 is to enclose this surface and abrasive blast it. This can be done with tripod arrangements on the top of the water tank or grain elevator that hold a canopy or "bonnet" above the roof. If this is not done, there are four methods of paint removal enumerated in this subpart that can be used as alternatives. All of them, wet abrasive blasting, power tools or hand tools, vacuum blasting, or chemical stripping are generally less contaminating than dry abrasive blasting. The first three have been discussed previously in the treatment of Class III bridges above. They are also cited in the discussion of Class II and Class III storage tanks in parts 7025.0340 and 7025.0350. Chemical stripping is described later in the treatment of Class III storage tanks in part 7025.0350, subpart 5. It is important to note that the definition of power tools in part 7025.0210, subpart 13, specifies that power tools that abrade the surface, such as rotary sanders, must be equipped with a HEPA filter vacuum. If they are not used with such filtration and without external containment, they can produce and disperse small paint particles just as abrasive blasting, but without the added effect of air pressure.

All of these methods, except vacuum blasting, may require dry abrasive blasting after the existing paint is removed in order to do adequate surface preparation. It is important that all the lead paint be removed before abrasive blasting of these areas. Because this blasting is only to abrade the steel surface and/or to remove flash rust or pitted rust, a relatively small amount of emissions would be produced. These emissions would not be contained, and for this reason it is reasonable to specify that this abrasive be a low-dust nonsilica abrasive according to the definition in part 7025.0210, subpart 11. The low-dust property addresses nuisance fugitive dust and the nonsilica property addresses any potential effects to the public health.

Subpart 4. This subpart states that the owner or contractor shall completely cover the ground beneath the base of the structure, and on the downwind side of the structure with 100 percent impermeable tarpaulins to prevent deposition on soil and vegetation. The owner or contractor shall overlap the tarpaulins at least 1-1/2 feet and weight them to prevent separation. The use of ground cover with curtains provides the containment necessary for Class I storage structures. These components are further referenced in the requirements for Class II and Class III ructures. The general conditions stated here are similar to the requirements for the use of ground cover at bridges.

Ground cover and curtains complement each other in that the curtains contain the dispersal of the lead paint particles, and the ground covers provide an impermeable surface for deposition from which they can be collected and recovered. It is reasonable to require that the ground beneath the base of the structure be completely covered. Different storage tanks have different configurations. Multileg water towers, for example, have a center column surrounded by a ring of support columns or legs that join the perimeter of the water reservoir. The base of a hydropillar and a pedestal tank consists of a single column. The area underneath the reservoir of a water tank will be inside the vertical extension of the curtains, and it is necessary that this entire area, including the upwind side, be covered. If the curtains are used effectively and in low windspeeds, this area should collect most of the particulates that are generated by abrasive blasting. The ground covers laid on the downwind side of the tank will collect a large part of the remainder.

It is reasonable to require that the tarpaulins be overlapped and that they be weighted to prevent separation. Movement of hoses, ropes and cables, and machinery and equipment, as well as foot traffic can drag tarp edges and expose underlying soil surfaces. Any gaps between the tarps will allow contamination of the soil or loss of waste materials. It is essential that the ground covers be 100 percent impermeable, whether they are canvas or nylon-reinforced plastic tarpaulins or woven polypropylene fabrics. Impermeable ground cover does not cost any more than permeable fabrics, and they prevent any contamination of underlying soil.

Items A, B, and C provide the minimum length of ground cover for water towers, standpipes and grain storage bins, and ground storage tanks. These dimensions differ, because the configurations of the type of storage structure are different. The width of ground cover is stated separately in language common to all these structures.

Items A and B. These items state that ground cover for a water tower shall extend from the center column a minimum distance equal to two-thirds the height of the tower, and that ground cover for a standpipe or grain storage bin shall extend from the base a minimum distance equal to one-half the height of the structure. The diameter of the center column of a water tower is significantly smaller than the diameter of the reservoir or bowl, and is therefore significantly inside the outermost painted steel surface of the structure. The horizontal distance between these two components is approximately the difference between two-third and one-half the height of the structure, or one-sixth the height. For a tank of 100 ft height this would be about 17 feet. Because ground cover extends from the center column for water towers and from the base of the wall for standpipes and grain bins, the length of ground cover as a function of height will be similar for these different structures. The ground cover will extend to a distance equal to about one-half the height of each of these storage structures measured from the vertical extension of the outermost surface. This means that the distance of the outer edges of the ground cover from the top of the storage wall will have a constant relationship. It is this relationship that is important for pollution control, and it is reasonable that the minimum distance of ground cover address the differences in structural design between the different elevated storage structures. By doing so the effective minimum distance of ground cover is approximately the same.

Item C. This item states that ground cover for a ground storage tank shall extend from the base a minimum distance equal to 20 feet, or to the height of the tank, whichever is greater. It is reasonable to require additional ground cover on these structures compared to those in items A and B, because it is relatively easy to implement this added level of protection. Because of their reduced height or their small size, ground covers can be laid beneath these tanks to a distance equal either to their height or to 20 feet with a small quantity of tarps in a little time. This is analogous to the full-height curtain requirement on these tanks which was discussed in subpart 2, item B, above. This requirement is reasonable, because of the evident benefit that derives relative to the additional cost. It is also reasonable, because ground storage tanks can be abrasive blasted with only a downwind curtain in place according to the proposed rule. Additional ground cover compensates somewhat for this reduced pollution control requirement. Because ground storage tanks include tanks of relatively small height and also portable tanks, a minimum of 20 feet of ground cover is reasonable. Dispersal of particulates is not a function of height for such structures, but rather a function of the blast pressure, turbulence, and rebound distance of abrasive blasting itself. These independent factors attributed to the removal process require a minimum amount of ground cover for these small or short bodies.

This subpart further states that the owner or contractor shall increase the width of the ground cover with distance from the base of the structure, so that it is equal to an area within an angle of 120 degrees from the center of the structure, except that the width of the ground cover all always be greater than the width of the downwind curtain. Throughout the proposed rules the dimensions of containment are expressed not in absolute numbers, but in factors relative to the dimensions of the steel structure, such as the height, the circumference, etc. This is done for two reasons. First, the potential for lead contamination is a function of the dimensions of the structure. As stated earlier, dispersal of particulates is a nonlinear function of the height and the amount of lead paint removed depends on the size and surface area of the steel structure. Second, there is a great variety in shape and size of steel structures in the state. To specify absolute numerical measurements of pollution control materials would only achieve a desired effect on a structure-by-structure basis. This would make the proposed rules unreasonably long and cumbersome.

The minimum width of the ground covers is provided here in general terms applicable to all Class I storage tanks, namely the width described by an area of 120 degrees, with the apex of the angle at the center of the structure. The downwind curtain required for an elevated storage structure must have a width greater than the diameter of the tank, according to subpart 2. This width is approximately equal to 115 degrees of the circumference. This is less than the minimum width of ground cover, 120 degrees, or one-third of the circumference. Nevertheless, it is necessary to state that the width of the ground cover must always be greater than the width of the downwind curtain. Curtains and ground cover work in combination with the ground covers collecting the deposits that are prevented from dispersal by the curtain. It is important that the ground covers always be beneath a curtain, and that they extend on either side of the width of the curtain. Because these are minimum dimensions, an owner or contractor may use curtains whose width is greater than that required. This would mean that part of a curtain may not be underlain with ground cover. In addition, on those structures whose diameter changes with height, like pedestal tanks, lead paint might be removed from portions of the surface behind a curtain whose absolute width would be greater than the 120 degrees ground cover near the base. These conditions provide the need to completely cover the ground beneath the base of the structure stated at the beginning of this subpart.

Subpart 5. This subpart states that the owner or contractor shall not conduct paint removal whenever windspeeds render the curtains and ground cover ineffective in containing particulate matter. If visible emissions of particulate matter occur in the air, or visible deposits occur on the ground at a distance from the structure greater than the distance of the ground cover, then the owner or contractor shall take any of the actions stated in items A, B, or C.
These are: (A) add additional ground cover, in the manner required in subpart 4, to a distance greater than the distance of visible particle transport or deposition; or (B) use additional curtains to prevent the dispersal of visible particles to a distance beyond the ground cover; or (C) use a method of removal from part 7025.0340 or 7025.0350, instead of dry abrasive blasting to remove the lead paint.

This provision describes the circumstances under which the owner or contractor must stop work due to inadequate pollution control, and what can be done to continue paint removal. The headnote to this subpart in the proposed rule is titled "windspeed limitation." It is air movement or wind that causes particulate matter to escape pollution control and to contaminate the environment, and it is the speed of this wind that will determine the distance of dispersal of this material. Rather than cite a numerical windspeed limit in the rule, a "performance" standard is applied that is dependent on wind conditions and the effective use of containment. This standard is comprised of two parts, "visible emissions" of particulate matter in the air, or "visible deposits" on the ground, at a distance from the structure greater than the distance of the ground cover.

Except for item B, the language of this subpart is very similar to that of part 7025.0270, subpart 4, for Class I bridges. The need for these provisions and the reasons for these requirements are very much the same as those set forth in the discussion of the windspeed limitation provision for bridges in this Statement of Need and Reasonableness (SONAR). Class I bridges require the use of suspended curtains whose length reaches the ground on all sides of the paint removal. Class I storage tanks do not have such a restrictive requirement. For this reason, item B of subpart 5 provides for the use of additional curtains to curtail visible emissions and visible deposits. This may mean the use of wider curtains, longer curtains, or more curtains than the owner or contractor had in place. For ground storage tanks it may mean the use of windscreens on the upwind side of the tank to reduce airflow to the downwind curtain.

Subpart 6. This subpart states that the owner or contractor shall clean up all visible deposits of waste material containing paint or paint particles at the end of each workday and remove this material from the site or store it in containers, or on top of ground cover, and covered with impermeable tarpaulins. In addition, it states that the owner or contractor shall recover this material by manual means or by vacuum, but may not use an air pressure or water stream which redistributes the waste material. Further, methods of handling and movement of waste material shall prevent fugitive dust and other loss of any material until final disposition of the material.

The proposed rules require both containment during lead paint removal, and cleanup afterward, to assure that material that is not collected by the containment is not allowed to remain in the environment. This language is very similar to part 7025.0270, subpart 5, for Class I bridges except that the phrase "..from all areas on the ground and the ground covers outside the curtains.." is added to the cleanup requirements for lead paint removal from bridges. This difference means that at storage structures waste material that is collected inside vertical containment must be removed at the time that visible deposits are recovered from outside this containment. All waste material must be cleaned up from inside and outside the curtains, and from the ground covers, and the ground, at these structures. There are several reasons for this difference. First, curtains suspended beneath a bridge enclose a space that is protected from precipitation that would cause additional dispersal on the ground. This condition is not met by storage tanks. In addition, curtains underneath some bridge sections are likely to remain in place at all times, because they are less subject to the effects of wind. They would act to inhibit access by the public to the contaminated area beneath the bridge deck. Also, many bridges are not sited in areas where the public, and particularly children, have access, whereas water tanks are very often within, or close by, residential or public use areas like schools or parks.

The use of vacuums during cleanup of storage structures does not require HEPA filtration. There are a number of factors that account for this difference. As stated earlier bridges with lead paint usually have very high concentrations of lead in paint. This is not true of storage structures. Therefore the amount of lead in the waste deposits that are cleaned up at most storage tanks would generally be significantly less. Reentrainment of small amounts of this material by use of filters that do not meet the HEPA standard would not cause serious contamination. Second, HEPA vacuum units are not generally available for rent and they are expensive ($700 to $1000) to buy. The use of this equipment for one or two small storage tanks would not be cost effective. That is, the benefit of smallest-particle filtration in these circumstances is less than could justify such expense. The cleanup provision for storage tanks applies to all tanks of any size and to all methods of paint removal. A HEPA standard would not be proportionate where simple hand tools are used to remove lead paint. Similarly, it would not be reasonable to require either manual means of cleanup <u>or</u> HEPA filtration of vacuum equipment on small low-cost projects. These two methods are very different in terms of both cost and thoroughness of cleanup. Bridges, on the other hand, generally have large surface area relative to small storage tanks and repainting of these structures, whether total or partial ("spot repair"), involves a relatively large expense. The use of vacuum machines with HEPA filters constitutes a smaller proportion of the total cost of repainting bridges than it would for certain storage tanks.

It is important that cleanup of waste material be done daily to prevent further dispersal of this material by wind, rain, and foot traffic of the workers. If the site is accessible by the public, children could be readily exposed to waste materials that are not confined or stored. There have been reports of children playing in the lead-contaminated waste sand collected beneath a municipal water tank. The total lead concentration of the abrasive waste generated from storage structures can be very high. The reasonableness of the other provisions for cleanup that are similar to the requirements for Class I bridges in part 7025.0270, subpart 5, are treated above in that discussion.

7025.0340, Class II storage structure

Subpart 1. This subpart states that an owner or contractor who removes lead paint from a storage structure that requires Class II pollution control shall use a method of removal and containment in this part or in part 7025.0350 as minimum pollution control. There are three methods of removal cited in this part for Class II structures, in subparts 2, 3, and 4. In addition, there are five methods of removal and containment for Class III structures in part 7025.0350. These methods are generally less contaminating than the methods for Class II, and it is therefore reasonable to allow the owner or contractor to implement any of them on Class II structures.

Subpart 2. This subpart states that if wet abrasive blasting is used to remove lead paint, the owner or contractor shall use the methods required in part 7025.0330, subparts 2 to 6. The owner or contractor shall use an amount of water such that dispersal of particulate matter is suppressed without loss of waste material from the ground cover by runoff. The methods required in part 7025.0330, subparts 2 to 6 relate to curtains, removal above curtains, ground cover, windspeed limitation, and cleanup of waste material, respectively. It is reasonable that these materials and procedures be required when wet abrasive blasting is used to remove lead paint from a Class II storage structure, because these are minimum measures necessary to prevent pollution when dry abrasive blasting is done on Class I structures which bear less lead paint or present less effects of lead contamination than Class II structures.

Wet abrasive blasting is cited as a method of removal in two other places in the proposed rules, in part 7025.0290, subpart 2, for Class III bridges and in part 7025.0350, subpart 4, for Class

III storage structures. In these cases, the minimum impermeability of curtains is 85 percent rather than 100 percent impermeable as specified here. The difference here is between partial and total containment. The minimum dimensions of the curtains referenced in part 7025.0330, subpart 2, do not enclose the circumference of the storage structure whereas they do so for Class III storage structures. The steel of Class III bridges is confined during paint removal on all sides with overlapping curtains. It is reasonable to require impermeable curtains to compensate for containment that is less than total, because these are Class II structures, that is, either the quantity of lead on the structure or the distance to receptor properties is greater or less than the standards in the table in part 7025.0310.

It may be necessary to do dry abrasive blasting after wet abrasive blasting is completed. Part 7025.0320, Pollution Control Required, states that if dry abrasive blasting is conducted after paint removal, the owner or contractor shall use the containment methods required in part 7025.0330, subparts 2 and 4, except that a low-dust nonsilica abrasive may be used without curtains for receptor properties B in the table in part 7025.0310, subpart 3, if

$$\frac{\text{height of structure (ft)} \times \text{surface area structure (ft}^2\text{)}}{5{,}000} < 10$$

and for receptor properties C in the table in part 7025.0310, subpart 3. Unless these conditions are met the same impermeable curtains are required if dry abrasive blasting is conducted for surface preparation after paint removal. As long as this containment is in use for paint removal, it is reasonable that it also be used to reduce fugitive dust from additional blasting. The purpose of this blasting would be to remove rust from the steel surface prior to application of new coatings. With the use of rust inhibitors in the water, this additional work may not be necessary. The requirement regarding the quantity of water used in wet abrasive blasting is the same as that cited for wet abrasive blasting girders and trusses of a Class III bridge in part 7025.0290, subpart 2, and the steel surface of a Class III storage structure in part 7025.0350, subpart 4. It is cited here for the same reasons discussed in that part of this SONAR.

Subpart 3. This subpart states that if power tools or hand tools are used to remove lead paint, the owner or contractor shall (A) use the methods required in part 7025.0330, subparts 2 to

6, except that, if hand tools are used on ground storage tanks only then the use of curtains is not required; and (B) remove all lead paint with power tools or hand tools. Because of the configuration and height of ground storage tanks, it is reasonable to not require curtains where hand tools are used to scrape lead paint from the surface. The reasons for this are similar to those discussed for dry abrasive blasting Class I structures of this type with a single downwind curtain in part 7025.0330 above. Methods of paint removal in combination with containment are apportioned to the three different classes of storage structures Class I, II, and III. These methods are proportionate in their effect on preventing pollution to the risk of pollution. Hand scraping a Class II ground storage tank without a curtain will cause significantly less potential for contamination than abrasive blasting the same structure with a downwind curtain under the same conditions.

Further, the owner or contractor must remove all lead paint with power tools or hand tools. It is important to make this statement in the rule, because of the prospect of following the use of these tools with dry abrasive blasting. As stated previously, there are two circumstances where hand and power tools may be inadequate to remove old coatings and corrosion, in tight or angled spaces, and on surfaces with corrosion below the surface. In addition, certain tools cause too little surface profile and others provide too much. This method of paint removal; therefore, may require abrasive blasting of areas that are hand or power tooled before the surface is recoated. Although there are pollution control requirements for this process stated in part 7025.0320, Pollution control required, they are not very restrictive and they are conditional on the dimensions and the location of the storage structure, as described above. The use of ground cover and the conditional use of curtains is predicated on an assumption that there is no lead paint to be removed by this process. It is therefore very important that all lead paint first be removed with hand or power tools so that lead paint particles are not generated and dispersed during any secondary abrasive blasting that may be necessary for surface preparation.

Curtains would have to be used for abrasive blasting of steel surfaces that had been power tooled without curtains, if the structure was in proximity to group A properties or to group B properties that meet the conditions in part 7025.0320. Curtains would not be necessary for group C properties. Because of this requirement, owners or contractors may choose to use curtains during power or hand tool paint removal with or without vacuum recovery attachments. The need for secondary abrasive blasting would depend on the degree of corrosion and the surface tolerance requirements of the new coatings to be applied.

Subpart 4. This subpart states that if dry abrasive blasting within a total enclosure is used to remove lead paint, the owner or contractor shall use the methods required in part 7025.0330, subparts 2 to 6, except that the owner or contractor shall totally enclose the structure with material rated by the manufacturer at not less than 100 percent impermeable during lead paint removal from all parts of the steel structure, including the top surfaces.

Dry abrasive blasting of storage structures within total enclosure is exemplified by the Totally Enclosed Painting Environment containment systems used on water towers and other elevated structures. This is a proprietary product marketed by Eagle Industries of Louisiana for sale or rent. Contractors have fabricated similar systems with custom ordered containment materials. Spokes of metal bars are welded around the top of the structure with cables strung from the free ends of these "outriggers" to anchors in the ground. This cylinder of cables is used as a framework that supports a sleeve of containment fabric that surrounds the storage structure. The system is suspended by a hoop at the top edge and it is reinforced by other hoops that serve to keep the wind from blowing the curtain against the steel legs or the center column. The enclosure is raised and lowered by cables that run down through the center column operated by a winch system on the ground. The dome of these tall structures can be enclosed by a "bonnet" supported by one or more tripods and attached along the bottom edge to the top hoop. Once such a system is installed, it can be raised and lowered very quickly, saving mobilization time. In sudden adverse weather conditions, this feature may also save the fabric from damage. On bulk fuel storage tanks with floating lids, outriggers can be fabricated that are attached around the rim of the shell to hold a wall of containment outside the wall of the tank. Application of new paint is done inside the same enclosure to prevent overspray problems.

Other methods of total enclosure of a storage structure use standing support structures, rather than suspension from the structure itself. Some of these include using trucks with a manlift or "cherry picker" to suspend a shroud over the steel structure, hydraulic columns raised in a ring around the tank, and telephone poles planted around the tank. The application of these methods, and others, depends on the height and diameter of the steel storage tank. For a number of similar tanks in one place (e.g., a tank farm), a custom-built metal framework that supports containment fabric can be lifted and lowered over individual tanks during abrasive blasting and repainting.

7025.0350, Class III storage structure

Subpart 1. This subpart states that an owner or contractor who removes lead paint from a storage structure that requires Class III pollution control shall use a method of removal and containment in this part as minimum pollution control. Like other statements of applicability that begin preceding parts of the rules this subpart informs the owner or contractor of his/her obligations for pollution control for Class III storage structures. The methods of paint removal and the methods of containment for this level of pollution control are enumerated in subparts 2 through 6. Because these structures require the most restrictive pollution control, Class I and Class II methods cannot be used. However, under part 7025.0220, subpart 2, Use of alternative methods, an owner or contractor might use such a method or combination of methods if the commissioner approves a written request.

Subpart 2. This subpart states that if vacuum blasting is used to remove lead paint, the owner or contractor shall use the ground cover and cleanup methods required in part 7025.0330, subparts 4 and 6. The owner or contractor may use vacuum blasting without the use of curtains if (A) the owner or contractor holds the workhead of the vacuum blasting unit at all times against the substrate during paint removal; and (B) all parts of the vacuum blasting equipment are in a condition that prevents emissions of particulate matter. However, if the owner or contractor cannot maintain complete contact between the workhead and the coated surface at all times then the curtains and the windspeed limitation required in part 7025.0330, subparts 2 and 5, shall be used.

Ground cover is required with vacuum blasting paint removal, as it is with all the methods of this part and indeed all the parts that address storage tanks. It is very effective in preventing soil contamination, and it is relatively cheap in both material and labor. It is necessary because even the methods that integrate vacuum recovery in the paint removal process, i.e., power tools and vacuum blasting, do not eliminate the release of all particles, due to human error, mechanical failure, and the fact that surface configuration will not always conform to the workhead, which reduces the efficiency of the vacuum system. Cleanup is necessary for the same reasons that ground cover is required. Paint particles collected on the ground cover must be recovered, and any that collect on the ground itself must also be removed.

It is necessary to maintain complete contact between the workhead of the vacuum blasting unit and the painted steel surface. If this is not achieved then abrasive blasting with vacuum blasting equipment is the same as conventional dry abrasive blasting. This phenomenon is very common where vacuum blasting is used. For this reason, it is reasonable to require both curtains and the provisions of the windspeed limitation be applied in this circumstance. The use of the word "cannot" rather than "does not" makes an important distinction. Otherwise the owner or contractor could make little or no effort to use the vacuum blasting equipment appropriately, and according to this provision could then use the partial containment with curtains described in part 7025.0330, subpart 2. To do so would not provide adequate pollution control on these Class III structures. The provisions of this subpart are essentially the same as those that are required for vacuum blasting Class III bridges in part 7025.0290, subpart 5. Further discussion of this method of paint removal and the conditional use of curtains is found in that text of the SONAR above.

Subpart 3. This subpart states that if dry abrasive blasting inside a modular enclosure with negative air is used to remove lead paint, the owner or contractor shall use the cleanup method required in part 7025.0330, subpart 6, and shall (A) construct an enclosure of impermeable material to totally contain the area of paint removal and to transport waste material to the ground; (B) maintain the enclosure at less-than-atmospheric air pressure during abrasive blasting by use of a dust collector with HEPA filtration of exhaust air to eliminate dust emissions; (C) use impermeable ground cover beneath the area of paint removal to a minimum distance from the base equal to one-half the height of the structure; and (D) use either a recyclable or nonrecyclable abrasive, but a recyclable abrasive must be cleaned to remove nonabrasive material before it is reused. Further, the volume of air evacuated per minute from the enclosure must be greater than the volume of the enclosure and the combined volume of output per minute of all blast nozzles inside the enclosure.

The idea of modular enclosure is to apply total containment to a structure, but rather than contain the whole structure only the portion of steel surface that is abrasive blasted is enclosed at one time. Because it is mobile, the enclosure is then moved to an adjacent area in a sequence that includes all parts of the structure that need repainting. With negative air this system can achieve very high containment efficiencies. Although these "mini-enclosures" require less square feet of containment fabric or barrier materials compared with total-structure containment, more hardware may be necessary to construct a framework that closely conforms to the contours of the storage tank and that prevents collapse of the enclosure under negative air. The assembly and movement of these materials can incur significant labor costs. Unlike a bridge, where modular containment structures can also be used, the convex surfaces of a storage reservoir and the additional components of center column and legs of a water tower can make it more difficult to enclose isolated surfaces. However, once the enclosure is constructed and installed, mobilization consists only in moving it to an adjacent area or to a similar component. Paint particles must not only be confined as they are removed, but they must be transported to the ground in total enclosure. This can be a distance of one or two hundred feet in the case of elevated towers. Because these are Class III structures, it is important that this material not be allowed to fall any distance without being contained with impermeable material as stated in item A.

In fact the control and movement of waste materials in item A is an effect of the provision of item B which requires "less-than-atmospheric" or negative air pressure inside the containment by use of a dust collector with HEPA filtration. This language is identical to that in 7025.0290, subpart 4, for dry abrasive blasting Class III bridges in total enclosure with negative pressure. The discussion of why such a requirement is reasonable for bridges applies also to storage structures, and is found on the pages of this document that address 7025.0290, subpart 4. The configurations of containment structures installed above or below a bridge deck will look quite different from those used on elevated tanks due to the difference in height and the necessity of transporting paint particles to ground level. However, the capacity of the dust collector necessary to achieve and maintain negative air depends only on the total volume of the enclosed space.

The minimum distance of ground cover required for this method of paint removal is stated in item C as equal to one-half the height of the structure. This provision differs from the ground cover requirements for part 7025.0330, subpart 4, which varied according to both the height and the form of the storage structure. Because of the total enclosure of paint removal under negative air, these factors will have little effect on dispersal of paint particles. Similarly, it is not required that the width of ground cover increase with distance from the structure. Rather, impermeable ground cover must be used only "beneath the area of paint removal." Nevertheless, it is reasonable to require minimum ground cover for environmental protection during spills, and other accidents that may occur with this method of paint removal. For this reason the distance of ground cover is proportionate to the structure's height, because in the event of a breakdown in the containment system, emissions will travel further according to the height of their release.

The provision of item D is identical to that in 7025.0290, subpart 4, for dry abrasive blasting Class III bridges in total enclosure with negative pressure. The discussion of the reasonableness of this language as it applies to bridges is applicable also to Class III storage structures.

Subpart 4. This subpart states that if wet abrasive blasting in total enclosure is used to remove lead paint, the owner or contractor shall use the ground cover, windspeed limitation, and cleanup methods required in part 7025.0330, subparts 4 through 6, and shall (A) totally enclose the structure with material rated by the manufacturer at not less than 85 percent impermeable during paint removal from all parts of the structure, including the top surfaces, and if dry abrasive blasting is used for surface preparation; and (B) use an amount of water such that dispersal of particulate matter is suppressed without loss of waste material from the ground cover by runoff.

The containment required for wet abrasive blasting for a Class III storage structure combines total enclosure with a minimum of 85 percent impermeable curtains. Wet abrasive blasting with partial enclosure with impermeable curtains and ground cover is specified as an acceptable method of paint removal for Class II storage structures in part 7025.0340, subpart 2. This method of paint removal is also cited in part 7025.0290, subpart 2, for Class III bridges, used with curtains rated at least 85 percent impermeable that confine all sides of the steel surfaces from which lead paint is removed. Class III bridges have the most restrictive pollution control (with Class IV bridges). This same method of removal and containment is cited as an acceptable means of paint removal for Class III storage structures, which require the most environmental protection. The reasons stated for this provision for bridge steel are relevant also to these Class III storage tanks and can be found in the treatment of part 7025.0290, subpart 2, of this document.

Although the curtains used on Class II storage structures are impermeable, it is not required that they fully enclose the structure. The partial containment that is specified does not require the suspended curtains to either surround the circumference or to reach the ground. By contrast, wet abrasive blasting of Class III structures requires total enclosure with fabric that is "not less than 85 percent impermeable." This permeability rating is fairly standard and these curtains are comparably priced to the 100 percent rated fabrics. Because the 85 percent rating is a minimum standard, owners or contractors can use impermeable curtains. However, for the reasons given in the discussion of the effect of the addition of water above, the 15 percent "permeability" factor is thought to have little environmental detriment, and it may result in reduced labor costs. The additional permeability may allow more rapid drying of the steel surface during and after wet abrasive blasting. For this reason, 85 percent mesh containment is acceptable for both wet abrasive blasting of lead paint and subsequent dry abrasive blasting. It would not be reasonable to require different fabric for secondary abrasive blasting if the 85 percent curtains were used during paint removal. This could result in a doubling of the cost of containment materials without significant benefit. The use of wet abrasive blasting may require additional surface preparation before the new coatings are applied. The need for pollution control in this circumstance is determined by part 7025.0320.

The provision in item B that limits the amount of water that can be used for wet abrasive blasting a Class III storage structures is included also in part 7025.0340, subpart 2, for wet abrasive blasting Class II storage structures and in part 7025.0290, subpart 2, for wet abrasive blasting Class III bridges. It is important that the proportion of water to abrasive not exceed that that causes runoff. This will vary with the humidity and also with the height of blasting. The farther the water and particulates fall, the more drying will occur in midair. Basically, water that carries lead paint particles that runs off the ground cover will wet the soil and present more difficult cleanup. Lead paint particles that are carried by water will adhere to the soil surface after the water absorbs into the ground. Dry vacuuming of this material during daily cleanup will not readily remove these deposits from the surface unless the material is disturbed by raking or other means. This is additional work that may not result in removal of "all visible deposits." Too much water on hard surfaces can flow to a curb and gutter and be directed to a storm sewer.

From here it will be carried to a waterway or to a water treatment plant before discharge into a water body.

Subpart 5. This subpart states that if chemical stripping is used to remove lead paint, the owner or contractor shall use the ground cover, windspeed limitation, and cleanup methods required in part 7025.0330, subparts 4 through 6, and shall (A) extend the ground cover beneath the area of paint removal and raise the outside edges to prevent runoff; (B) use wide-blade scrapers and low-volume high-pressure water spray applied within a distance of one foot to remove all coatings; and (C) remove all lead paint with chemical stripping.

Chemical stripping uses either solvent or alkaline paste to remove oil-base paint or other coatings from a steel surface. Several companies today market the paste strippers, some types of which, are formulated specifically for steel structures. The product is applied to the exterior surface for a prescribed period of time, and then it is removed with the paint coatings by either scraping or spraying with high-pressure water. In order to thoroughly remove the paint and the stripper after scraping, water is sprayed against the surface. Following this process, most new coatings require that the surface be further neutralized before the new paint is applied. This is done with additional water spray or with the use of neutralizer rinses. In addition, because chemical stripping does not impart a surface profile to the steel, secondary abrasive blasting may be necessary on those tanks that have not been blasted before. This depends on the type of new coating to be applied. Some epoxy paints and urethanes are less surface tolerant than oil base paints. Blasting may also be necessary to remove any flash rusting that may occur after neutralization.

The use of ground cover is essential for this method of paint removal as with all other methods. As described in subpart 4 of part 7025.0330, this containment material must be used beneath the base of the structure and on the downwind side of the structure to the distances specified for the different kinds of storage structures in items A, B, and C. The waste materials generated by chemical stripping are unlike those generated by all the other methods of paint removal in these rules, in that they are not as subject to the effects of wind dispersal, especially when they come from the walls of a ground storage tank. The paste that is scraped off will be too large and too heavy to blow any distance downwind. Water spray applied to the downwind wall of a large diameter ground storage tank will be somewhat protected from the effect of the wind, much like abrasive blasting particles. Nevertheless, the windspeed limitation and cleanup are necessary for chemical stripping, because of the use of this water spray which could carry stripping compound and paint past the ground cover. This would be most likely where stripping was done on an elevated structure.

It is for this reason that item A states that the ground cover must extend beneath the area of paint removal. In addition, it is necessary, because of the water that is used, to require that the edges of the ground cover be raised to prevent runoff. Although the water consumed with a high-pressure low-volume sprayer is only about one-third gal/minute, more than one person may operate a sprayer during the removal process. A large amount of the water used is absorbed by the paste as it is taken off, and any standing water on the impermeable covers will evaporate in normal conditions. Rainstorms, however, might wash the stripper compound off the surface and onto the ground cover with the lead paint. In addition, as described above, more than one water wash may be done of the tank surface. Finally, because lead in certain paint compounds is amphoteric, that is, it is soluble at both high and low pH, the lead in the alkaline paste (pH 13) may leach into soil if it is mixed with water. In order to contain these wastes, one stripper manufacturer recommends the use of several layers of impermeable plastic sheets overlain with plywood. The plywood allows shoveling of the "sludge" into containers. A berm can be constructed underneath the perimeter of the ground cover to confine the liquid and semi-solid waste. For the reasons stated, it is reasonable to require the edges of the ground cover to be raised, but the proposed rules do not specify a particular means to do this.

In item B, the use of low-volume water spray is specified to reduce the amount of water and the runoff that may result. The use of the spray within one foot of the surface is significant because in order to effectively remove the paint and the stripper with a low water volume sprayer, the sprayer must be in close proximity to the steel surface. The distance requirement ensures the use of equipment that will cause the least contamination of soil due to either runoff or to rebound of water particles. These are sprayers that use small amounts of water under high pressure.

The provision in item C, that all lead paint be removed with chemical stripping, is reasonable because abrasive blasting is often used for surface preparation after stripping. In this regard, this method of paint removal is similar to the use of hand tools and power tools. These are cited in part 7025.0340, subpart 3, for Class II storage structure with the same provision for complete paint removal by this method. There are reduced requirements for pollution control to contain this secondary abrasive blasting which are predicated on an assumption that the particulates will not include lead paint particles. For this reason it is necessary to state that all lead paint must be removed with chemical stripping. The requirements for pollution control during secondary abrasive blasting are found in part 7025.0320.

Subpart 6. This subpart states that if power tools that are equipped with vacuum recovery are used to remove lead paint, the owner or contractor shall (A) use the methods required in part 7025.0330, subparts 2 and 4 through 6, except that if all parts of the vacuum equipment are in a condition that prevents emissions of particulate matter, then the use of curtains is not required; and (B) remove all lead paint with power tools with vacuum recovery.

It is reasonable not to require curtains where the power tools are equipped with vacuum recovery, and where this equipment actually works to prevent emissions of particulates. Additional cost of curtains would be incurred for both material and labor. Many electric and pneumatic rotary sanders and needle guns or scalers are manufactured with shrouds that surround the workhead. Negative pressure is obtained by vacuum withdrawal coupled with HEPA filtration of the exhaust air. Unlike vacuum blasting in subpart 2, above, which may require curtains in place, these would be redundant and an unnecessary expense with vacuum-equipped power tools that functioned properly. The difference is that full contact must be maintained between the workhead of the vacuum blasting equipment and the steel surface due to the very high air pressure of the blasting process, and the need to confine the paint and abrasive until they are withdrawn. With power tools waste materials are only lost when the cfm of the vacuum is not high enough to remove the paint dislodged or abraded from the surface. The recovery system does not depend on a seal to create a vacuum. Also, paint is only removed when the machine is applied against the coated surface, whereas abrasive blasting with vacuum blasting equipment, will remove coatings whether or not contact is maintained with the steel surface.

The requirement that all lead paint be removed with these power tools is due to the possible need to do abrasive blasting for surface preparation after paint removal and before the new coatings are applied. This issue is identical to that discussed for use of power tools and hand tools on Class II structures in part 7025.0340, subpart 3, above. Additional discussion of power tools and hand tools can be found in part 7025.0290, subpart 3, for Class III bridges.

7025.0360, Pollution control required

This part states that an owner or contractor who removes lead paint from the exterior surface of a steel structure that is not included in parts 7025.0260 to 7025.0300 and 7025.0320 to 7025.0350, shall use the methods required in part 7025.0370, except that paint removal conducted only for the purpose of coatings analysis is exempt. These structures include, but are not limited to, railcars, pipelines, boats and barges, transmission towers, transformers, light poles, exterior metal components of buildings, parking ramps, handrails, and vehicles that are used for commerce or industry or construction. This part of the proposed rules addresses those structures that can be coated with lead paint that are neither bridges nor storage structures. They may be relatively large in surface area, but they do not fit a discrete category of structures, except perhaps that they are not already included in the parts of the rules cited above. They vary significantly in configuration, size, and also in the range of concentrations of lead in the coatings on their surfaces. This variety of potential sources of lead paint contamination are grouped together and referred to as "other steel structures."

All of these different steel bodies can have lead in the paint that covers them. The amounts of lead paint on railcars were discussed above in the treatment of lead paint on steel structures in Minnesota in III.B.2.d. above. Examples of lead concentrations on other steel structures were cited there also. Additional examples are provided here of some of the concentrations of lead in the coatings on these different structures. The hand rails along the walkway of bridges can be painted with red lead paint. The longest bridges will have the greatest amount of lead on these rails and associated steel. The ornamented rail panels along the Mendota Bridge comprised approximately 8,700 ft^2 of lead painted steel surface. Paint samples of another hand rail that was 3,000 ft long showed a maximum of 35.0 percent total lead. Testing of the coating on steel panels on a building at the University of Minnesota indicated 1.3 percent total lead by weight. The steel exterior of a building facade of a downtown building was coated with paint containing 9.4 percent lead. The supporting steel frame of a billboard had a large concentration of lead in the paint, and that on the steel supports of a downtown theater sign was 22.3 percent lead. The steel beams of one parking ramp that was sandblasted had over 1 percent lead in the paint.

The rule would be very long and cumbersome if additional parts were written describing pollution control requirements for lead paint removal from parking ramps, and other parts were written to address railcars or transmission towers. Rather, these structures are regulated by language already cited for either bridges or storage structures. Pollution control is necessary, but as stated in part 7025.0370, the owner or contractor applies a method of paint removal and containment according to previous parts of the rule.

Paint removal from a vehicle that is not used for commerce, industry, or construction by the vehicle owner; who does not act as a contractor; and who is not a licensed vehicle dealer; is exempt. This means that persons who remove paint from a vehicle that they own do not have to comply with this rule if the vehicle is for personal use only and is not used commercially. That is, the rule does not apply to the owner of a passenger vehicle who removes paint in the course of doing bodywork on the car or truck even if it contains more than 0.5 percent total lead. Nor is testing of these vehicles required to determine the quantity of lead in the paint. However, if the person is paid to repaint the vehicle, and therefore acts as a contractor according to the definition in part 7025.0210, subpart 7, the rule would apply. Contractors who repaint vehicles for money, because of the large amount of paint removed, can cause serious environmental contamination and risk to the health of residents of neighboring property, especially where sandblasting is not done inside a building or is done without containment. Similarly, vehicle dealers or their employees who remove paint from vehicles that they own are not exempted. This would include any vehicle, including passenger vehicles and agricultural machinery and implements. This is specified, because of the large number of vehicles that might be repainted at one place over time.

Sandblasting vehicles of all kinds causes complaints every year. Certainly more individuals and companies are engaged in this business than are identified by the complaints received by the MPCA or other public organizations. Often this is done on residential property next to other residences. At other times it is done on undeveloped or partly developed property with no regard to potential contamination. All vehicles with steel bodies have lead in the "e-coat" or electrodeposition primer coat applied by the manufacturer. Today these coatings have approximately 1.5 percent lead by dry weight. About six years ago (~ 1988) the automobile paint companies voluntarily reduced or eliminated lead from the additional coatings applied during manufacture (the primer surfacer, base coat, and clear coat). Although lead is not present in the base coat of most newer vehicles, it can be added to the base coat during "end of line" repair of the finishes at the factory. These refinish paint products are used at vehicle plants for coating repair, but they are primarily used in the after-market. Apart from the lead in the electrodeposit primer, lead on newer automobiles and passenger trucks comes from refinishers used for body repair and repainting. Any of the refinisher paints acrylic, enamel, urethane, epoxy, lacquer, etc., can contain lead or lead compounds in high concentrations (e.g., 60 percent by weight). Older vehicles that have experienced the most corrosion would most likely be abrasive blasted around the state, oftentimes outdoors with no pollution control. These would contain lead in the primer, and in the original base coat as well as in any refinisher coating used after manufacture.

Commercial vehicles would include school buses that are owned by private companies, but not those that are owned and operated by school districts. However, body work and repainting done on those buses owned by school districts is contracted out in most cases. This paint removal, done by a contractor, would be regulated by this rule. Unconfined sandblasting of school buses is a perennial problem that generates complaint calls each year. Those buses that are owned by private companies would be repainted by those companies or contracted out. In either case these vehicles would not be exempt, because they are commercial vehicles.

Vehicles used in industry and construction include front-end loaders, bulldozers, dump trucks, tanker trucks, and service vehicles. As with any steel bodies these vehicles will eventually experience some level of corrosion that will require either paint removal and repainting or panel replacement. Like school buses many of these vehicles are painted either yellow or orange. These coatings typically have chromium and/or lead in high concentrations in the base coat. Like all vehicles they also have lead in the electric deposition coat. In addition, many of these vehicles are part of a fleet of a number of vehicles owned by a company or a public agency or department. This means that either employees of the owner or a contractor may repaint a number of these bodies at one time. This results in a greater potential for lead paint contamination at the worksite and surrounding areas if effective pollution control is not implemented. The conventional means of removing this paint has been to sandblast it, oftentimes outside without containment.

7025.0370, Lead paint removal requirements

This part states that if lead paint is removed from a steel structure not included in parts 7025.0260 to 7025.0300 and 7025.0320 to 7025.0350, the owner or contractor shall (A) apply a method of removal and containment according to parts 7025.0310 to 7025.0350, as if the structure were a storage structure; or (B) if the steel structure is mobile, portable, or is disassembled, conduct paint removal inside a building or an enclosed structure; or (C) if the steel structure traverses a water body or is in or above a water body, the owner or contractor shall apply a method of removal and containment according to parts 7025.0250, 7025.0260, and 7025.0280 or 7025.0300, as if the structure were a bridge or a bridge portion.

These items list three methods of complying with the proposed rule if an owner or contractor removes lead paint from a steel structure that is neither a bridge nor a storage tank. For fixed structures that are neither mobile, portable, nor disassembled, and that do not traverse a water body and are not in or above a water body, the provisions of parts 7025.0310 to 7025.0350 for storage structures are applied as stated in item A. Such structures would include towers, transformers, light poles, building exteriors, and parking ramps. These parts of the rule might also be applied to such bodies as railcars and vehicles, which, although they are mobile, could be done outside "a building or an enclosed structure" (as stated in item B) with the methods prescribed.

Lead paint on mobile bodies, like railcars and vehicles; on portable objects, such as small fuel tanks; or on any structures that are disassembled, can be removed inside a building or an enclosed structure according to item B. If lead paint is removed in an outside location, these structures can also be contained using the provisions in item A that refer to storage structures. However, for those fixed structures that are sited near water bodies, the methods of removal and containment described in parts 7025.0250, 7025.0260, and 7025.0280 or 7025.0300 for bridges and bridge portions must be used. This is the language for lead paint removal from Class II and Class IV bridges, which are either above or within 100 feet of water bodies. For the structures regulated by part 7025.0370, however, this distance requirement does not apply. Rather these either traverse a water body or they are in or above a water body. Such structures include pipeline and boats and barges. The latter two may be repainted in the water or they may be repainted on land or in drydock.

7025.0380, Restrictions

Subpart 1. This subpart states that the owner or contractor shall dispose of waste materials that contain lead paint or lead paint particles generated by the removal of lead paint from steel structures as required by either chapter 7035, solid waste rules, or chapter 7045, hazardous waste rules, whichever applies. Testing and disposal of waste materials is an integral part of the process of removing lead paint from steel structures. Basically, because of the presence of heavy metals in the paint that is removed, the TCLP test (EPA test method 1311) is done to determine if the waste material is hazardous or non-hazardous. The acceptable methods of disposal vary for hazardous and non-hazardous (solid) waste. It is reasonable that the existing state regulations be referenced here so that owners and contractors are aware that these rules apply to the waste materials that they generate. There are no new requirements in the proposed rules that would either supplement or provide any exemptions to the solid waste and hazardous waste rules.

This provision in subpart 1 complements the purpose of these rules, which is to reduce and prevent contamination of the environment with lead paint and lead paint particles. Sampling, testing, documentation, transportation, treatment, and disposal of the waste are regulated by existing state and federal requirements. Noncompliance by the owner or generator in handling and disposal of the lead paint contaminated waste can result in simply transferring some or all of the lead paint from the steel structure to some component of the environment.

Subpart 2. This subpart states that an owner or contractor shall not apply paint that contains more than one-half of one percent (0.5 percent) total lead by weight in the dried film to the exterior surface of any new steel structure or of any steel structure that is repainted. The prohibition on the use of lead paint, like the provision in subpart 1 above, addresses a part of the process of removal of lead paint. That is, any steel from which lead paint is removed must be recoated in order to prevent additional corrosion. It would be inimical to the purpose of these rules to apply lead paint again to this surface. At some future time, unless the structure was demolished, this paint too would have to be removed. This process would pose a new hazard to the environment and would require costly measures of pollution control. On the other hand, removal of the new coatings that contain less than 0.5 percent total lead would not be subject to the provisions of this rule. It is reasonable that this prohibition apply to new structures and also to those that are repainted. It is these latter that are the subject of these rules, but to forbid these coatings on new structures will prevent risks to both the workers and the public as well as to the environment at the time that these coatings are removed. The owners of these new structures will realize significant cost savings for both removal and disposal as a consequence.

In 1991, Minn. Stat. § 115A.9651, prohibited the deliberate introduction of lead, cadmium, mercury, or hexavalent chromium into any dye, paint, or fungicide intended for use or for sale in Minnesota after July 1, 1994. This statute, "toxics in products," was amended in 1992 and again in 1993. Subdivision 1 of this law now states that "No person may distribute for sale or use in this state any...paint...manufactured after September 1, 1994, into which lead....has been intentionally introduced." The concentration of these metals in these products may not be greater than 100 ppm or 0.01 percent. Both the manufacturers or the users of these products may apply for an exemption to this prohibition which would extend the deadline to July 1, 1997.

This statute is related to the restriction on the use of lead paint in subpart 2, but it does not obviate the need for this provision in the proposed rule. First, the regulation prohibits the distribution of these products for sale or use in the state. It is directed at the manufacturers of the paint and not those who use the paint. This is somewhat ambiguous in the 1993 statute amendments because the word "use" may be either a noun or a verb in its context. The order of the two words "sale" and "use" was reversed in the 1993 amendment and a preposition was removed ("...for use or for sale..." was changed to "...for sale or use.."). However, the statute regulates primarily the manufacture of paint and other products that contain lead and other heavy metals. It is the manufacturers who distribute the products.

The prohibition on manufacture took effect on September 1, 1994. It would have no effect on any paint that contains lead manufactured before this date and owners and contractors are not prohibited from using paint made before this time. Lastly, any of the paint manufacturers or users may apply for an exemption that postpones the prohibition to July 1, 1997. Many paint manufacturers have already applied for this exemption.

Subpart 3. This subpart states that an owner or contractor shall not use high pressure water with or without abrasives to remove lead paint from a steel structure unless the water and paint particles are contained and recovered. Water blasting here means using high pressure water either with or without abrasive. The vehicle of propulsion here is the water under pressure. This contrasts with both dry and wet abrasive blasting which use compressed air to blast the steel surface. These methods are both defined in part 7025.0210, subparts 2 and 22. High pressure water can by itself remove coatings of paint from steel surfaces due to the high pressure that can be achieved with water blasting equipment (e.g., 30,000 psi). Water pressure with added abrasive can also abrade the steel surface.

The problems with this method of paint removal are the large volumes of water that are used and the large distance of rebound of this water off the steel surface. These can cause serious soil contamination due either to run-off from the ground cover or hard surfaces, or to direct deposition of the water on unprotected soil. Measures necessary to remove lead paint from the soil due to water deposition would depend on the particle sizes and the depth of contamination. Larger particles may be removed by scratching the soil surface after drying and then dry vacuuming. This might clean vegetated areas also. In many cases, small particle leaching below the surface may require removal of the soil surface in bare areas. Such contamination can be prevented by containing the water with impermeable curtains and ground cover. The edges of the ground cover would need to be raised to form a basin deep enough on the "downhill" side to hold all the water and paint particles. Evaporation of the water would reduce the volume of water to be treated and disposed. This is the only method of paint removal that is not specified in the proposed rules that is cited for use with restrictions. It is reasonable that this method of paint removal not be prohibited in itself, but rather that the potential consequences be prevented. These are due to the effects of the water medium.

Subpart 4. This subpart states that the contractor shall post its name and telephone number in letters and numbers at least four inches high on a vehicle or on a sign at the property from the beginning of lead paint removal until completion of the contractor's work on the structure or structures. It is reasonable to require the contractor to identify itself by both name and telephone number on a vehicle or on a sign at the property in order to readily identify the party responsible for the removal of lead paint. It is not customary for abrasive blasting contractors in the state to post such information. Consequently, it is more difficult for the public or for government officials to determine this information in order to initiate or respond to complaints. This provision will have the effect of encouraging the contractor to act responsibly and to be accountable for its activity. On the other hand, if the contractor complies with the requirements of this rule there should be little incentive for it to desire anonymity in any part of the process of lead paint removal.

The letters in the company name and the numbers in the company telephone number must be at least four inches high. This is reasonable and it supplements the identification requirement. It is not sufficient that the name and number simply be posted. It must be of a size that can be read from a distance. It is reasonable that the sign be either posted on the property or painted on a vehicle at the worksite. If a contractor did not want to identify its trucks or if he/she were renting vehicles, it would be just as good to provide identification with a sign posted on the property. On the other hand, if the vehicles were already signed, it would be unreasonable to require additional signs, although these could be provided if the contractor intended to advertise his or her work. Whenever there is work at the site done by a contractor there will be a vehicle at the site to carry materials or equipment or to pull equipment trailers.

This identification provision does not apply to owners who remove lead paint from steel structures that they own. First, the owners of large structures or facilities would be readily known from either the name of the company visible on the property or from the location itself. In addition, owners are required to submit notification to the commissioner of the MPCA and to certain neighboring properties where more than 500 ft^2 of lead paint will be removed.

Compliance with this provision will serve to identify both the owner and the contractor, either one of which might remove lead paint. If a consultant company is involved it too would be identified by the notification required in part 7025.0240.

V. SMALL BUSINESS CONSIDERATIONS IN RULEMAKING

Minn. Stat. § 14.115, subd. 2, requires the MPCA when proposing rules which may affect small businesses, to consider the following methods for reducing the impact 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.

"Small business" means a business entity including farming and other agricultural operations and 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 annual sales of less than $4,000,000. Minn. Stat. § 14.115, subd. 1 (1994).

There are two ways in which the proposed rules may affect small businesses. The intent of the statute addresses small businesses as regulated bodies. In the context of the proposed rules, these are both owners of steel structures who remove lead paint and the contractors who might remove lead paint from these structures. As discussed in 'VI. Consideration of Economic Factors' below, it is the owners who bear the additional costs of pollution control that would be imposed by the rules. Some of these owners will meet the definition of small businesses. The effect of the rules on small business contractors will be to establish standards of procedure for removal of lead paint. In general, the economic effect of the proposed rules on these companies will be positive while, in general, the economic effect on small business owners will be negative.

The proposed rules will affect small businesses who are either owners or contractors as defined in Minn. Stat. § 14.115. As a result, the MPCA has considered the methods listed above for reducing the impact of the rule on small businesses. In general, nearly all of the contracts for bridge repainting in Minnesota are done by companies that are not small businesses. Water storage tanks are repainted by contractors that are both large and small businesses as are fuel tanks at petroleum refineries and storage facilities. Most of the 38 companies that are on the "steel structures contractors" mail list, one of five mail lists developed for this rulemaking, are small businesses.

The reporting requirements in the proposed rules are the notifications to the commissioner and to the residents of buildings and to the owner or administrator of any child care or school buildings located within the distances prescribed in part 7025.0240, Notification. These notifications are required if more than 500 ft^2 of lead paint is removed from the exterior surface of one or more structures. They are the obligation of the owner of the structure. This means that those small businesses with relatively small structures are exempted from the reporting requirements. Most small businesses who own a fuel storage tank or other commercial or industrial equipment would either have less than 500 ft^2 of total surface area with exterior lead paint or they would remove less than 500 ft^2 of lead paint from these surfaces in one year. In either case they would be exempt from the notification provisions. This meets the criterion of "less stringent reporting requirements" cited in section 14.115, subdivision 2.

Furthermore, small business owners would be more likely to remove less than 200 ft^2 of lead paint from steel surfaces in one year. Because of this they could use any method of paint removal and containment for any class of pollution control as provided in part 7025.0320, Pollution control required. There are nine such methods specified for storage structures. This requirement would also apply to a contractor hired by a small business owner. This meets the criteria of "less stringent compliance requirements" and the "simplification of compliance requirements" cited in section 14.115, subdivision 2. There are no schedules of compliance in the proposed rules.

The engineering controls or operational standards in the proposed rules establish minimum requirements for methods of removal in combination with containment. "Visible emissions to the air" and "visible deposits on the ground" indicate if these methods are sufficient. These simple performance standards are included in subparts 'Windspeed limitation' and 'Cleanup of waste material' in parts 7025.0270 and 7025.0330. These are not numerical standards and they do not require either monitoring or media sampling. They are very practical and inexpensive and they can be applied immediately on the project to determine the need for additional containment or further cleanup.

The work practice standards are fundamental to compliance with the rules and they are applicable to all lead paint removal from exterior steel surfaces. It is not feasible to substitute additional performance standards for the minimum pollution control requirements in the rules. As stated in IV.A. 'Reasonableness of the Rules as a Whole' above, the function of such standards in the proposed rules is better served by engineering controls. The new requirements of the proposed rules are not onerous to small business owners of steel structures, and in many cases they provide a means to comply with existing regulations that have been violated as described in III.A. 'Need for compliance with current regulations' above. Additional performance standards in the place of specific pollution control requirements would impose additional costs and they do not substitute for primary pollution prevention.

It is the purpose of these rules to remediate the effects on the public health and the environment of practices of removing lead paint from steel structures. Small businesses are among the regulated parties of the proposed rules, because some of them own structures with exterior steel surfaces coated with lead paint. To exempt small businesses from the minimum provisions of these rules, therefore, would be contrary to the objectives that are the basis of the regulation. The exemptions described above, however, provide to these owners fair and reasonable measures to apply necessary pollution control. For a specific discussion of "farming and other agricultural operations" see section VII below.

VI. CONSIDERATION OF ECONOMIC FACTORS

In exercising its powers, the MPCA is required by Minn. Stat. § 116.07, subd. 6, to give due consideration to economic factors. The statute provides:

> 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.

In proposing these rules, the MPCA has given due consideration to available information as to any economic impacts the proposed rules would have. These effects can be treated generally as income and expenditures that are due to compliance with the provisions of the proposed rules. The process of lead paint removal is part of the process of repainting the exterior steel surface. As the steel surface begins to rust the deteriorated paint must be removed and replaced with new barrier or corrosion-inhibiting coatings. Such regular maintenance prevents more serious corrosion of the steel structure. The direct costs of lead paint removal are borne by the owners of the steel structures that bear lead paint.

Paint removal involves from one to three major parties: owner, contractor, and consultant. The contractor does the actual work of removing coatings, surface preparation, and paint application. The consultant, or specifier, does the evaluation of the degree and extent of the corrosion and prepares the contract specifications for the owner. Employees of large industries, such as petroleum refineries, may do coatings maintenance of exterior steel components of the industrial plant that may include fuel tanks, pipe and pipe racks, electrical boxes, and exterior structural steel. These companies would not employ a contractor or a consultant. Other large industries do hire contractors for coating maintenance of their infrastructure. Public utilities, on the other hand, often engage both consultant and contractor companies for large repainting projects such as municipal water storage tanks. By contrast, state and local highway departments repaint bridges with employee work crews and they also use bridge painting contractors. Bridges with smaller amounts of corrosion are repaired by department employees while bridges that are totally repainted are done under contract. Usually they do not use consultant services. The costs incurred by the owner of a steel structure are earnings paid to the consultant and the contractor.

The effect in cost of the proposed rule on any one owner will depend on the customary practices of that owner. For those owners who currently use or prescribe containment according to the 1990 MPCA staff recommendations (exh. 6), the additional cost of pollution control will be reduced compared to an owner who has not used pollution control. The proposed rules allow latitude to the owner and contractor in both the use of pollution control and in the use of alternative methods of paint removal. In addition, procedures of containment and methods of removal, or combinations of these, that achieve equivalent measures of pollution control can be approved by the commissioner as stated in part 7025.0220. This flexibility can have the effect of limiting the cost of these provisions. The issue of municipal "taxes" cited in the statute is addressed specifically in section VIII, 'Cost to local public bodies,' below.

In terms of payment for the equipment, materials, and labor necessary for lead paint removal contracts in the state, and the effect of these transfers on the state's economy, there are three transactions that may occur. Payments may be made by Minnesota owners to Minnesota companies that produce products or that provide contract labor or consulting services. Such trades may increase the Gross State Product, enhance employment within the state, and provide a larger personal income and commercial tax base. The specific effect of such payments on the state's economy will depend on the comparable value of the economic activities displaced by this expenditure. Facility or structure owners or contractors who purchase equipment from companies outside the state are paying for "imports" that increase the earnings of these out-of-state manufacturers. To a lesser extent, the same effect occurs when contracts are awarded to companies outside the state for work on structures in Minnesota, although this is offset by the effect of worker spending on the earnings of local businesses. Lastly, when Minnesota companies work for out-of-state owners either as consultants or contractors, or manufacture products sold out-of-state, money comes into the state, which adds to the state's economy.

Most of the consultant companies involved in water tank maintenance, and most of the contractors who work on steel structures of any kind in Minnesota, are Minnesota companies. These include the companies that work on the largest projects with the biggest budgets, the larger state and federal highway bridges. Rainbow, Inc., of Minneapolis, is one of the three largest companies in Minnesota that do bridge repainting. In addition, they repaint some water tanks, fuel tanks, and pipelines. Company earnings are about $10 million per year. For 1993 and 1994 about 80 percent of all work was done in Minnesota, and 20 percent was done in other states, approximately $2,000,000 per year. Full-time employees number 150 to 160 in the summer.

Abhe & Svoboda, Inc., of Prior Lake, have done 100 percent of their lead paint removal work in 1993 and 1994, outside of Minnesota. They do a lot of bridge painting as well as water and fuel tanks on government property and stadiums. Their gross income is $20 to $25 million per year, and they employ on average about 150 people. Johnson Bros. Corp., of Litchfield, does work both inside and outside the state. In 1993 about 80 percent, and in 1994 about 90 percent of their contracts were for owners outside Minnesota. Gross earnings are about $110 million per year. Approximately 50 to 60 percent of this total is derived from bridge work that also includes concrete and steel repair. Water treatment and industrial plants are also among their clients. There are approximately 700 full-time employees company-wide.

In addition to these large Minnesota contractor companies, there are at least two manufacturers of products used in the lead paint removal industry that are based in the state. 3M, of St. Paul, makes abrasive pads or "coating removal discs" for both right-angle and straight-shaft grinders and the "flaps" for heavy-duty rotary peening tools. These are used in the power tool machines of Desco, Trelawny, Unique Systems, and Dynabrade companies. Annual sales of these products amount to more than $1,000,000 and growth increased 120 percent in the last year. In addition to sales to these manufacturers, 3M also sells replacement discs and flaps to power tool distributors who sell them to contractors who use power tools. More than 90 percent of these sales are to companies outside Minnesota. Power tools are a specified method (with hand tools) of paint removal for Class III and IV bridges (parts 7025.0290 and 7025.0300) and Class II and Class III storage structures (parts 7025.0340 and 7025.0350).

Entech Industries, Inc., of East Grand Forks, fabricates dust collectors for the steel structures industry with capacities of 6,000 cfm, 30,000 cfm, 40,000 cfm, and 55,000 cfm. The company sells all of the units it produces about 20 machines per year. In 1994 sales reached $1.4 million an increase of 300 percent over 1993. Current full-time employees number from 10 to 24. About 90 percent of sales and rentals are to companies outside Minnesota. Dust collection equipment is specified for dry abrasive blasting in total enclosure for Class III and IV bridges (parts 7025.0290 and 7025.0300) and in modular enclosure for Class III storage structures (part 7025.0350).

These examples provide some context to the economics of the lead paint removal industry in Minnesota with respect to the region and the rest of the country. There is an assortment of public and private relationships between owners of steel structures, and those who remove lead paint from their surfaces. These are given further treatment in the discussions about specific structures that follow. One very important consequence of the promulgation of this regulation may be the economic effect on the contractor companies, the consultant companies, and the manufacturers of paint removal and collection equipment. Minnesota will be among the first states to specifically regulate the removal of lead paint from steel structures with comprehensive rules. Because of federal Title X every state will have to regulate this activity (in addition to residential, public, and commercial buildings) or it must adopt final federal regulations. The effect inside the state may be increased sales and increased lead paint removal work that would benefit the private sector of the economy. The effect of formal regulation outside of Minnesota is not quantifiable, but it is possible that state businesses in this industry may acquire a reputation for experience and compliance with lead paint removal regulations that may improve their competitive advantage.

A. Water storage tanks

Unlike bridges, there have been no comprehensive studies of the costs of removing and containing lead paint from water tanks. For one thing, the owner of such structures who may want to compare the costs of these projects has only a small number of potential study subjects. Smaller municipalities might repaint a water tower every five or ten years, for example. Budgets do not allow experimentation with methods of paint removal and containment, but only what is determined to be the most cost effective. By contrast, state highway departments own a number of bridges, and despite the limitations stated below, can derive comparative numbers from these structures in the same or successive years. In addition, water tanks vary greatly in size, height, and configuration and this makes it difficult to make useful comparisons, because of the importance of these factors to labor costs.

Nevertheless, information on costs of repainting different water tanks can be obtained from individual cities. Case studies of water tanks in Minnesota provide real numbers with which to evaluate the costs of pollution control. This information is more reliable for use in Minnesota than costs obtained from equipment manufacturer claims from costs calculated in another part of the country or from "average" numbers based on a number of structures that differ in physical attributes, and the nature of the pollution control that was applied. These costs can be calculated both in absolute figures, and in numbers relative to the total cost of the contract, or to the cost of exterior paint removal and repainting only. To serve the purpose of this analysis data from a single city or different cities should be qualified with the physical attributes of the individual water tank such as height, surface area, type, coatings thickness and condition, etc. In order to indicate the costs of complying with the provisions of the proposed rules the nature of the pollution control that was used must also be compared to the three classes of storage structure in the rules. A survey was prepared and mailed to a number of steel structure (but not bridge) owners and contractors in order to derive actual contract costs for pollution control requirements (exh. 20).

Information provided in the table below represents a single contractor working on four different structures in one city in 1993 and 1994. The contractor was the lowest of four bidders. Because this data is recent, it does not require inflation adjustment. In addition, the materials and methods used by the contractor may have been more efficient and productive than certain processes applied in years past. This advantage was offset by the lack of prior experience of this particular contractor in working on elevated water tanks reported by city staff, which undoubtedly reduced productivity. Nevertheless, the information summarized here gives a good representation of costs to public utilities. The city referred to the MPCA staff recommendations of 1990 (exh. 6) in the contract and specified total vertical containment. The tanks were dry abrasive blasted inside curtains that enclosed the full circumference. This method of removal and containment conforms to Class II pollution control in the proposed rule (part 7025.0340, subpart 4), except that the entire top surface of the tank was not enclosed, but only that area within an angle of about 40 degrees measured from the center point. Also 85 percent impermeable fabrics were used instead of 100 percent impermeable.

Water Tank Pollution Control Costs

water tank	total Pb conc.	exterior surface area	cost of containment total (A)	cost of containment per ft^2	cost ext blast + ext paint (B)	$\frac{A}{B}$	$\frac{A}{A+B}$
standpipe (short) 1 M gals 70 ft hgt	5.5 %	15,015 ft^2	$28,500	$1.90	$56,700	0.5026	0.3345
standpipe (tall) 1 M gals 120 ft hgt	4.5 %	14,393 ft^2	$30,000	$2.08	$62,500	0.4800	0.3243
pedestal spherical 500 K gals 167 ft hgt	3.6 % 2.9 %	14,500 ft^2 (est.)	$27,500	$1.90	$66,800	0.4116	0.2916
multileg tower 500 K gals 122 ft hgt	1.2 %	22,350 ft^2	$34,900	$1.56	$92,900	0.3757	0.2731

M = million conc. = concentration
K = thousand ext = exterior

These four tanks were all repainted with pollution control that approximated Class II using dry abrasive blasting within total enclosure. Structural repairs, although part of this contract, are not included in these figures, because such repairs are not a part of lead paint removal. The costs of waste disposal were paid by the city and were not included in the contract bid. Also, because all four structures were awarded to one contractor, and they were done in succession, the costs of mobilization were somewhat reduced on each tank. Mobilization involves acquiring, transporting, and setting up necessary equipment, supplies, and materials. Because of this, the total costs on each tank are about 25 percent below those of a single tower contract, according to city staff. This would increase the costs of containment (total and per ft^2), but would have little or no effect on the ratios of cost of containment (A) to cost of exterior abrasive blasting and painting (B).

The ratio A/B shows the relationship of the cost of containment (pollution control) to the cost of repainting, that is exterior blasting and painting alone. The ratio A/A+B indicates the percent of the total cost of repainting (that is exterior blasting, painting, and containment) that is due to containment. Containment costs added 37.6 percent to 50.3 percent to the costs of paint removal and repainting, and comprised 27.3 percent to 33.4 percent of the total cost associated with repainting with pollution control. The costs of exterior blasting and painting (B) in the table increase as the two ratios decrease. The fact that these ratios become smaller means that for these water towers the cost of containment increases at a smaller rate than the costs of repainting alone. The cost of containment ft^2 of surface area ranged from $1.56 to $2.08.

With the specific conditions stated above these costs represent the costs of using pollution control on a Class II water tower. The costs of using a method of removal and containment that complies with Class III pollution control will be significantly more. In general, Class I structures that bear lead paint will be less expensive to maintain than Class II or III. The costs incurred in repainting a ground storage tank with the same degree of containment efficiency will be somewhat less than for an elevated water tank.

It is interesting to compare contracts between years to see if there is a real reduction in the cost of pollution control ft2 or in the percent of the total contract comprised by this cost. In 1992 a water tank was repainted by a contractor who also submitted a bid on a similar tank in 1993. This latter tank was the single column pedestal (spherical) in the table above. The earlier tank had the same configuration, but was smaller with a 300,000 gal capacity, a height of 122 feet, and an exterior surface area of 9,100 ft^2. The cost of containment for this structure was $27,500 or $3.02/ ft^2. These two structures are compared in this table.

Water Tank Pollution Control Costs
(1992 and 1993)

water tank	year	exterior surface area	cost of containment total (A)	cost of containment per ft²	cost ext blast + ext paint (B)	A/B	A/(A + B)
pedestal spherical 300 K gals 122 ft hgt	1992 (contract)	9,100 ft²	$27,500	$3.02	$41,860	0.6570	0.3965
pedestal spherical 500 K gals 167 ft hgt	1993 (bid)	14,500 ft² (est.)	$40,000	$2.76	$86,000	0.4651	0.3175

M = million conc. = concentration
K = thousand ext = exterior

This contractor was not the low bidder in 1993. The 1993 water tower was larger in volume and taller than the one in 1992. The contract specifications were similar, so that one can assume that a similar system of pollution control would have been applied to the second tank. In spite of these factors, the cost of containment was reduced $0.26 ft2 or 8.61 percent. The cost of containment as a percent of exterior blasting and painting was reduced 19.19 percent. This indicates that past experience and/or new methods, and equipment will tend to lower costs from year to year. However, this bid may also reflect a reduced cost of mobilization due to the fact, stated above, that four different tanks were awarded in the 1993 contract, and only a single tank was awarded in 1992. Waste disposal costs were not included in either contract.

B. Fuel storage tanks

The table below presents some summary statistics on the costs of repainting propane tanks. This information represents three different contracts completed by one contractor for different private companies in 1992. Propane tanks and ground storage tanks (or "flat-bottomed tanks") are the most common types of fuel storage tanks. The ground storage tanks found on large petroleum tank farms typically have a short cylinder shape with diameters that are greater than their height. Such configurations situated on elevated ground are also used for water storage reservoirs. Unlike these ground storage tanks, fixed tanks (or "bullet tanks") used for prop..ne with a length greater than height and rounded ends, are not used for water storage. The costs of pollution control in this contract are figured in dollars per ft^2 and as a percent of the cost of paint removal and containment. Unlike the previous tables for water tanks, the cost of waste disposal is included in the cost of these contracts (B and A + B in the table).

Fuel Storage Tank Pollution Control Costs

propane tanks	total Pb and Cr conc.	exterior surface area	cost Pb paint containment & recovery total (A)	per ft^2	cost ext blast + ext paint + disposal (B)	$\frac{A}{B}$	$\frac{A}{A+B}$
5 @ 30 K = 150 K gals	0.3 % 6.7 %	11,625 ft^2	$7,850	$0.675	$38,650	0.2031	0.1688
12 @ 30 K = 360 K gals	0.3 % 7.7 %	30,500 ft^2	$20,600	$0.675	$75,000	0.2747	0.2155
3 @ 17 K 1 @ 90 K =141 K gals	0.08 to 7.58 %	9,600 ft^2	$13,500	$1.406	$40,000	0.3375	0.2523

M = million
K = thousand

conc. = concentration
ext = exterior

The pollution control methods implemented in these contracts was comparable to Class II in the proposed rules. The containment used in the first two contracts was "perimeter containment with open top with ground cover" with wet abrasive blasting. This is more vertical enclosure than the curtains specified in the proposed rules for Class II storage structures for this method of paint removal. The last contract in this table shows an increased cost of pollution control in cost per ft^2 and less so in the ratios of A/B and A/A + B. This is due to the use of total containment, which included covering the top of the enclosure around each tank. This practice conforms to Class II pollution control for dry abrasive blasting of storage tanks.

Because the requirements of the proposed rules are structured on a number of conditions, most storage tanks at industrial sites will be Class I structures with a smaller number of Class II structures. In the classification used with storage structures in part 7025.0310, the required class of pollution control is partly determined by the receptor properties, that is, the property on which the structure is sited or any neighboring properties within the distances prescribed in the table in subpart 3. For structures such as fuel tanks that are located on industrial and agricultural property (group C), the receptor properties are only the neighboring properties. Because of this, and because of the distance standard of 100 ft for these properties, compared to 200 ft and 300 ft for other designated properties, Class I pollution control will be most often required on fuel tanks, especially those on a tank farm. Therefore, the costs in the table above are greater in most cases than those that would derive from application of the proposed rule to fuel tanks.

C. Bridges

There are a number of ways to examine the costs incurred in repainting bridges with the pollution control requirements of the proposed rules. The increased costs of materials and labor can be calculated based on estimates of increased quantities of containment equipment and materials and the increased work involved in mobilization, deployment, and maintenance of these systems. Statements about the costs of implementing some level of pollution control (e.g., total containment with negative air) or an alternative method of paint removal are often based on different structures located in different parts of the country. Although, such numbers are derived from actual bridge maintenance conducted in the field, it is very difficult to determine relative costs independent of these particular structures. Ordinarily a contractor will use a single method of removal (usually abrasive blasting) on an entire structure, and there is a lot of variation among structures in physical characteristics that affect the cost of paint removal and repainting.

Smith (1991) conducted a third party study of bridge maintenance methods that included costs, productivity, and containment efficiency of five different methods of paint removal on five different girder bridges: recyclable steel abrasive, power tools, vacuum blasting with recyclable (aluminum oxide) abrasive, vacuum blasting with slag abrasive, and dry abrasive blasting with a low-dust mineral abrasive (rf. 21). This study provided information on rates of production, costs ft2, containment efficiency, weights of waste generated, and cost of equipment. It is very difficult, however, to make useful comparisons between bridges because each bridge is characterized by different structural configuration, coating thickness and condition, and corrosion. In addition, the height of the bridge above the ground and the proportion above water and above ground differentiate each structure. Each of these factors will affect the determination of productivity, containment efficiency, and costs of the different methods. The structure itself becomes the principle variable in the study that affects the comparison of the methods of removal and containment.

Smith and Tinklenberg (1994) recently completed a study for the Federal Highway Administration (FHWA) that tested seven methods of paint removal on one span of a girder bridge (rf. 22). Because the same steel substrate was used, the values that were derived indicate real differences among the methods of removal. This comprehensive study includes a section on costs with a summary table (Table 25). Information derived from this table and the text of the study is reproduced below for six of the methods that are cited in the proposed rules. Some of the numbers have been revised from those in the table in the published report. Personal communication with Smith provided clarification and correction to some of the numbers. The footnotes provide these qualifications supplemented by information from the text. The values reported in the table are mean values. The study reports the cost of many of these items to have a large range. The table compares the cost of the different activities that comprise bridge maintenance repainting. It provides a good basis for analysis of the costs of methods of paint removal for a girder (not a truss) bridge. Hazardous or non-hazardous waste disposal, additional surface preparation, the degree of containment, and the height of the structure will all affect real costs on an individual bridge.

Bridge Paint Removal Costs [1]
(per square ft of steel surface)

	Removal and Repainting	Contain-ment	Disposal (w/o trans port)	Enviro Monitoring	Worker Health	Overhead [2]	Total
Dry Abrasive Blasting [3]	$2.50	$2.00 [a]	$0.50 [b]	$0.50	$1.50	$0.50	$7.50/ ft^2
Wet Abrasive Blasting	$4.00	$1.00 [c]	$1.15 [d]	$0.50	$1.50	$0.50	$8.65/ ft^2
Power Tools	$6.00	$1.00 [e]	$0.05	$0.50	$1.50	$0.50	$9.55/ ft^2
Vacuum Blasting	$8.00	$0.05	$0.25	$0.50	$1.50	$0.50	$10.80/ ft^2
Water Blasting [4]	$4.00	$3.00 [f]	$0.10	$0.50	$1.50	$0.50	$9.60/ ft^2
Chemical Stripping [4]	$2.50	$1.00	$0.50	$0.25	$1.50	$0.50	$6.25/ ft^2

[1] material and labor based on $25.00/ hr labor cost
[2] includes pollution insurance (largest item) and OSHA recordkeeping
[3] slag abrasive to near-white blast cleaning (SSPC-SP10)
[4] does not include secondary abrasive blasting (add $2.63/$ft^2$ [$1.00/$ft^2$ abrasive blasting, $1.50/$ft^2$ containment, and $0.13/$ft^2$ disposal] if structure requires add'n surface preparation)

[a] total containment with negative air/ dust collection
[b] slag abrasive with Portland cement or silicate and non-hazardous waste disposal
[c] mean of total containment of ground level structure without ventilation ($0.50/$ft^2$) and elevated structure ($1.50/$ft^2$); to collect all rinse water from elevated structure is $3.00/$ft^2$
[d] mean of collection and disposal from ground level structure ($0.90/$ft^2$) and elevated structure ($1.35/$ft^2$); disposal as non-hazardous waste
[e] power tools without vacuum recovery on elevated structure; power tools equipped with vacuum recovery will reduce costs of containment and environmental monitoring
[f] includes collect all water from elevated structure

(adapted from Smith, L.M. and G.M. Tinklenberg (1994) Lead-Containing Paint: Removal, Containment, and Disposal. Report No. FHWA-RD-94-100, FHWA, McLean, VA)

Most important for purposes of this rulemaking is the column "containment." This comprises pollution control activities. It is the only cost among those presented in the table that is attributed to the proposed rules. "Removal and repainting" consists of the basic maintenance activity of removing the existing deteriorated coatings, doing necessary preparation of the steel surface, and applying new coatings. "Disposal" includes the collection, testing, and appropriate disposal of the generated waste materials. Neither "environmental monitoring" nor "worker health" are requirements of the rule. These latter costs would be incurred by compliance with the new OSHA lead-in construction-industry standard (29 CFR 1926.62). The largest quantity in "overhead" cost is for pollution insurance, which is discretionary. The mean costs ft2 for "worker health" and "overhead" are identical for all removal methods. "Environmental monitoring" costs are similarly all the same, except for chemical stripping where this cost was reduced by half, due to the unique nature of this method of removal.

Rather than assume that the entire structure is either elevated or at ground level, mean values were used that combine the costs of containment and waste collection for these two situations. This makes the reasonable assumption that half a bridge will be elevated (over water or roadway), and half will comprise the two approaches (at ground level).

The different methods of paint removal, included in the table above are those cited in the proposed rules. Each is characterized by different rates of production. Rate of production, or productivity, is the number of square feet of paint removed, and surface prepared per hour (ft^2/hr). It is the largest factor in determining the cost per unit surface area, and the cost of a contract. The differences in both the cost of paint removal, and the total cost for the different methods in the table above, are largely a function of productivity. There is an inverse relationship between productivity (ft^2/ hr/ day) and cost per ft^2 (\$ / ft^2).

On any one structure in Minnesota, it is likely that lesser costs will be incurred for some categories. For example, environmental monitoring, because it is not a requirement of the proposed rules would be undertaken at the owner's or contractor's discretion. Nonetheless, the total costs of all of these activities for any one method are substantial. Kline (1994) addresses the question of bridge replacement versus bridge repainting based on analysis of the costs of rolled steel beams and welded plate girders, painting, and erection (rf. 13). These costs were compared to the costs of lead paint removal obtained through survey. He concludes, "...when the cost of lead paint removal, containment, worker safety and health, and waste disposal approaches \$10.00/ft^2, it may be more cost effective to build a new bridge." However, he adds that other important factors must be considered such as the condition of the bridge deck and the need for repairs or renovations of the structural steel. In addition, the age and projected life span of the bridge and future maintenance costs can be a determining factor. He concludes that if the deck of a bridge is deteriorated and needs replacement, structural repairs are due, and the bridge is somewhat past the midpoint of its useful life, it may be economical to replace the entire structure rather than to repaint it, if the total costs of repainting are computed at about \$10.00/ft^2 or more.

The use of actual case histories provides the most reliable information for assessing the costs of implementing the proposed rules on bridge maintenance in Minnesota. In recent years bridges have been repainted by MnDOT contractors using pollution control equivalent to Class I, II, and IV, and the cost of these contracts has been provided by MnDOT. Costs of containment are included in contracts as line items designated "lead substances collection and disposal." Calculations of these costs for representative bridges are presented here as a percent of the total contract and in units of dollars ft2.

An undertruss bridge that crossed a river in a residential area was repainted in 1992 using dry abrasive blasting, total containment with negative air, and dust collection. The steel surface area of the bridge was 76,000 ft^2. The items in the painting contract were "TCLP test," "mobilization," "painting metal structures (old)," and "lead substances collection and disposal." Disposal of the waste, however, was not paid by the contractor, but was handled by MnDOT. "Painting" comprised the removal of old paint, surface preparation, and repainting. This activity cost \$3.50/ ft^2. The total cost of the contract was \$541,600, and the cost of pollution control was \$250,000 or 46.2 percent of the total. Pollution control cost \$3.29/ ft^2. The total unit cost of this project was \$7.13 /ft^2. Workers would have increased productivity on a girder bridge where both the rate of paint removal and repainting would be greater, and this would reduce the cost somewhat. However, an overtruss bridge would have been more difficult to repaint due to traffic, unless it was temporarily closed. The location of this bridge would designate it as a Class

IV structure and the method of paint removal and containment that were used are appropriate Class IV methods.

A number of overpass girder bridges were repainted in 1991 in an area that would not be designated as either "residential" or "public use." Dry abrasive blasting with a low-dust mineral abrasive was done using impermeable curtains on four sides. The steel surface area of one of the bridges was 23,260 ft^2. In the original contract the removal of old paint, surface preparation, and repainting cost \$2.00/ ft^2. No pollution control was specified. Because this contract was deficient, a supplemental agreement was prepared that added Class I containment requirements. The additional pollution control cost \$2.24/ ft^2. On this one bridge the cost of containment exceeded the costs of painting by 12 percent. However, because this contract was not based on competitive bidding, this number is not entirely representative according to MnDOT staff. On the three remaining bridges in this contract the cost of containment was \$1.58/ ft^2. This is 79.0 percent of the cost of paint removal and repainting. These too were paid under a supplemental agreement. The location of this bridge would designate it as a Class I structure in the proposed rules, and the method of paint removal and containment were Class I methods from the guidelines issued in 1990.

An over and undertruss bridge above a channel of the Mississippi River was contracted for repainting in 1992. The methods used were representative of Class II pollution control requirements. The total surface area was 239,130 ft^2. More than half of the structure was sandblasted, primed, and coated at a cost of \$3.50/ ft^2. The remainder was cleaned by water blasting without removing primer (lead) paint and finish coated at a reduced cost. The total cost of the contract was \$1,145,064 and the cost of pollution control was \$409,140. Apportioning this cost over the portion of the bridge that was sandblasted and repainted added \$3.00/ ft^2, which is 46.2 percent of the total cost of paint removal, repainting, and pollution control. Additional items included in this contract were TCLP testing, mobilizaton, traffic control, and a traffic signal system.

The cost calculations from these three bridge projects are summarized in this table.

Bridge Pollution Control Costs

bridge	cost total	cost per ft^2	cost Pb paint containment & recovery total	cost Pb paint containment & recovery per ft^2 (A)	cost Pb paint removal + repaint per ft^2 (B)	$\frac{A}{B}$	$\frac{A}{A+B}$
1991 Class I	NA	NA	NA	$1.58	$2.00	0.79	0.441
1992 239,130 ft^2 Class II	$1,145,064	NA	$409,140	$3.00	$3.50	0.857	0.462
1992 76,000 ft^2 Class IV	$541,600	$7.13	$250,000	$3.29	$3.50	0.94	0.485

D. Other steel structures

Other steel structures include a great variety of structures that are neither storage structures nor bridges. Many of these are listed in part 7025.0360, 'Pollution control required,' such as parking ramps, light poles, railcars, handrails, and certain vehicles. These structures comprise a very disparate group in size, surface area, configuration, and even mobility. For purposes of the proposed rules, their only similarity is that they are not storage structures or bridges. For this reason, they are grouped together as separate parts of the rule. It not possible to provide general information on the costs of applying these proposed rules to repainting these structures. Costs for individual structures, such as those provided above for selected bridge, water tank, and fuel tank projects, would not provide very useful information, because it would be so specific, not only to the nature of paint removal and containment that was used, but also to that particular structure.

The pollution control requirements for removal of lead paint from the exterior surfaces of these structures are the same as for either bridges or storage structures. Because the requirements for these structures are adapted from the requirements for other structures, as stated in part 7025.0370, 'Lead paint removal requirements,' the cost information provided in the above text, especially the cost ft^2, might be used to estimate costs of "other steel structures," whether bridge or storage tank provisions are applied.

VII. IMPACT ON AGRICULTURAL LANDS AND FARMING OPERATIONS

Steel structures in farming operations that may bear lead paint are fuel storage tanks, fertilizer and pesticide tanks, grain storage bins, and vehicles. Storage tanks and grain bins are included in the provisions for storage structures. Heating oil, gasoline, diesel, LP, fertilizer, and pesticide tanks would be considered "ground storage tanks" in the definitions of the proposed rules. These have reduced requirements for pollution control compared to elevated tanks such as water towers.

Minn. Stat. § 14.11, subd. 2, requires that if an agency that proposes adoption of a rule determines that the rule may have a "direct and substantial adverse impact" on agricultural land in Minnesota, the agency shall comply with the requirements of sections 17.83 and 17.84. The MPCA does not believe that this rule will have a "substantial" effect on agricultural land. Certain monetary costs will be incurred in order to protect the public health, and the environment when lead paint is removed from certain structures on a farm or from grain storage bins owned by a co-operative or a grain company. In addition, bulk pesticide and liquid fertilizer tanks used by the farm industry would be subject to the provisions of the proposed rules whenever corrosion control required the removal of existing coatings of lead paint. There are about 1,000 of these storage facilities around the state. About half of these are owned by co-ops and half are owned by corporations or small businesses. These tanks are inspected by the state Department of Agriculture for corrosion on a regular basis. Instead of an "adverse impact" the use of pollution control will benefit agricultural land by preventing contamination with a toxic substance, which cannot be degraded, and can only be cleaned up at considerable expense.

There are several important provisions to consider in the applicability of the proposed rules to farm operations. These provide some exemptions due to the relatively small amounts of paint that are removed. Most of the fuel storage tanks found on family farms are relatively small, with less than 500 ft^2 of surface area. The proposed rules apply only to the removal of lead paint from the exterior surface of steel structures that have more than 0.5 percent total lead in the paint (part 7025.0210, subpart 10). This determination can be made by analysis of one paint sample for any storage tank with less than 1,000 ft^2 of surface area (part 7025.0230, subpart 2, item B). Second, the notification requirements (part 7025.0240, subpart 1) apply only for removal of lead paint from total surface areas greater than 500 ft^2. Smaller areas of removal do not require notice to either the commissioner of the MPCA or to the residents, owner, or administrator of neighboring buildings. Third, an owner or contractor does not have to determine the pollution control class of a storage structure or structures from which less than 200 ft^2 of lead paint will be removed (part 7025.0310, subpart 1). Basically any of the nine methods of removal and containment cited in parts 7025.0330 to 7025.0350 can be applied to these steel structures, including manual scraping. Lastly, vehicles that are used for agriculture, including farm implements, are exempt from the rules. However, removal of lead paint from vehicles used for commerce, industry, or construction is regulated by the rules (part 7025.0360).

Part 7025.0330, describes necessary pollution control where dry abrasive blasting (sandblasting) is done on Class I tanks. Class I storage structures, because of their size, height, or concentration of lead in paint, and because of their greater distance from receptor properties, have the least restrictive paint removal and containment requirements. Grain storage bins to which this rule would apply would most likely be determined to be either Class I or Class II structures. Fuel tanks, such as heating oil tanks and LP tanks that have lead paint and that are sited near a farmhouse, would be Class II structures requiring Class II paint removal and containment. One of these methods is hand tool removal such as scraping. The only pollution control necessary with this method is ground cover to protect soil from lead contamination. However, as stated above, Class II pollution control is required only if more than 200 ft^2 of lead paint is removed from a steel surface.

Minn. Stat. § 116.07, subd. 4, requires that if a proposed rule affects farming operations, the MPCA must provide a copy of the proposed rule and a statement of the effect of the proposed rule on farming operations to the Commissioner of Agriculture for review and comment. A copy of the draft rule was sent from the Commissioner of the MPCA to the Commissioner of Agriculture on September 6, 1994 (exh. 21).

As described in III.A.2.d., above, EPA is regulating lead paint removal from industrial structures under Title X of Housing and Community Development Act of 1992 (PL102-550). Steel structures are included under section 1021, wherein the Toxic Substances Control Act is amended by the addition of Title IV, "Lead Exposure Reduction." Steel structures are specifically cited in section 402 (b) of Title IV. This act and subsequent proposed regulation would affect steel structures in many parts of the economy, and it would also affect those related to agriculture. Because of this legislation, states must either adopt a regulatory program that addresses lead paint removal from a "...bridge, or other structure or super-structure..." or EPA must administer and enforce federal regulations in those states that do not have programs authorized by EPA. According to Title X EPA can approve a state program "...only if...(1) the State program is at least as protective of human health and the environment as the Federal program under section 402..., and (2) such State program provides adequate enforcement."

The proposed federal regulations under Title X were published in the Federal Register on September 2, 1994. These did not propose any new standards for removal of lead paint from steel structures, nor did they provide either an exemption for minimum amount of lead paint removal or exemptions for any particular sector of the economy such as agriculture. Title X legislation, as interpreted by EPA, applies to all steel structures. Given these constraints and the fact that even relatively small surface areas of exterior steel may have very high concentrations of lead in the paint, the proposed MPCA rules do not have such threshold exemptions. Instead, these rules include certain provisions, detailed above, that reduce the "regulatory burden" on owners and contractors that remove relatively small amounts of lead paint from structures including those in the farm industry. In so doing, MPCA staff has attempted to address a very serious environmental problem with requirements that are necessary, but also reasonable. According to an agency memorandum, from the EPA Office of Pollution Prevention and Toxics, the final federal rules are to be published on September 30, 1995.

VIII. COSTS TO LOCAL PUBLIC BODIES

Minn. Stat. § 14.11, subd. 1, requires the MPCA to include a statement of a proposed rule's estimated costs to local public bodies in the notice of intent to adopt rules, if the rule would have a total cost of over $100,000, to all local bodies in the state in either of the two years immediately following adoption of the rule. Among local units of government in Minnesota water utilities will incur the largest costs due to the adoption of these rules. Costs incurred in using adequate, and effective pollution control in maintenance repainting of water storage tanks will greatly exceed $100,000 for the state per year.

Using mean values of $30,000 for pollution control for a water tank, and 50 tank painting projects a year across the state, gives an annual cost estimate of $1,500,000 for the state. There is a great range in size of these tanks and also in the costs of pollution control requirements for Class I, II, and III structures. The amount of $30,000 would be a value for Class II containment on a tank of 500,000 gallons or less. Because of their location, most water tower projects will need to meet Class II provisions, but most water tanks in the state have volumes smaller than 500,000 gallons. There are approximately 1,000 steel water tanks in the state owned by municipalities. Perhaps 800 of these have not been constructed or repainted in the recent past, and therefore, have exterior lead paint on the surface. With a mean coatings lifespan of 15 years, a few more than 50 water tanks would be repainted each year. Because it is based on approximate figures, the calculation of total annual cost is a reasonable estimate.

It is important to point out that these added costs are not entirely due to the promulgation of these rules. Many municipalities, both large and small, have included pollution control requirements in their water tower painting contracts in recent years. This is due in large part to the MPCA staff recommendations that were prepared and distributed to all Minnesota cities in 1990 (exh. 6), as described in the Introduction above, and to the concern for the health of the residents. There is a strong incentive also to avoid citizen complaints, and the costs of cleanup and potential litigation. Costs of containment have been incurred by municipalities already. The economic effect of these costs to the city is a function of the size of the city and the budget for the water utility. Three case studies are presented here that represent cities of three different sizes.

East Grand Forks, MN (pop. 8,800), repainted a 500,000 gal elevated multileg water tank in 1992. The city owns three water towers and a water treatment plant for the source river water. There are about 2,250 service connections (water meters) in the city. The total cost of the water tower contract was about $294,000 of which city staff estimates about $100,000 was for containment, recovery, and disposal of the lead paint. In 1992 the city water budget for operating expenses was about $960,000, which included operation, maintenance, and administrative costs, without depreciation. For a number of years gross water revenues had been less than expenses, and this difference was made larger when depreciation was added. Beginning in 1992, the city changed its rate structure so that the monthly service charge no longer included a minimum amount of water consumption, and larger meters were charged more than smaller ones. The minimum monthly charge for 1992 was $3.70. These service charges were increased by 10 percent each year. The minimum monthly charge for 1994 had increased to $4.48. Water rates too, which had increased in every previous year, were increased again in 1992 by 10 percent and this rate of increase continues through the present ($2.54/1,000 gals/month for 1st 2,000 gals in 1994).

Accounting methods, such as depreciation and whether repairs and repainting are capital or maintenance costs, may vary by city. In addition, maintenance expenses such as water tank repairs are paid by rate increases that are carried over from year to year and not by one-time surcharges. Because of this, it is difficult in general to determine the amount of such increases that are due to pollution control requirements. Nevertheless, according to city staff of East Grand Forks, the cost of pollution control for the 1992 water tower project could have been recouped in one year with a rate increase of about 17 percent, or an increase of 4 percent to 5 percent over four years. As it did in 1992, the city is budgeting part of the recent service and rate increases to pay for the next water tower repainting project. Cities like this one, which use surface water as the source of city water, operate water treatment plants which add significantly to the operating budget of the public utility. Although relatively few cities in the state use surface water for water supply, the cost of treating this water will substantially increase the water bills of the residents.

This variable too makes comparisons difficult between cities when examining the effects of pollution control costs on the customers.

The city of Rochester, MN (pop. 74,408), probably has more water tanks per capita than any other city in Minnesota-17 total, 13 of which are steel. The city uses well water, which explains the large number of water reservoirs. It does not have a water treatment plant, and it has one of the lowest water rates in the state. In 1993 there were 24,730 water meters in the city. Rochester Public Utility, a company owned by the city, operates the water utility. Costs must be paid from cash reserves or by rate increases without any debt. Continued population growth has caused large variations in the operating budget from year to year. New well construction, new water mains, and water main repairs all contribute to the size and variation in the budget. Rochester had four water towers with lead paint that were repainted in 1993 and 1994.

The annual budget of the Rochester water utility is about $3 million apportioned in equal amounts to service fees and to consumption rates. It is water rates, rather than service fees, that pay for the costs of maintaining the city water towers. The total cost of containment for the four water tanks in the 1993-94 contract was $120,900, which was 4.03 percent of the annual water budget or 8.06 percent of the total water rate revenues. This translates into a mean cost of approximately 1 percent of the water budget per water tower per year or 2 percent of water rates per water tower per year. These rates were increased by 5 percent in 1992 and 1993, and there was no increase in 1994 or 1995.

The East Grand Forks and Rochester examples indicate the effects of costs of repainting water tanks on a small town and a medium size city. By comparison to small towns, larger cities, or wealthier cities can better afford to implement pollution control measures to protect the health and property of their residents during lead paint removal from water tanks. These municipalities will not experience large effects to the city budget as a consequence. The economic effects on smaller towns will be greater, and reasonably these will be inversely proportional to the size of the city budget.

Sandstone, MN (pop. 2,088), repaired and repainted a four-leg 150,000 gal water tower in 1994. The city has only 420 water service accounts (about 800 residents are in a federal correctional institution). The total cost of the water tank project was $145,738 and included interior and exterior paint removal and repainting, mobilization, structural repairs, and fees for inspection, consulting, and legal. The city specified Class II pollution control in the contract according to the draft rule provisions, but the contract did not have a line item for the costs of containment. The city obtained a loan for the amount of the water tank project from the Farmers Home Administration (FmHA). The loan included additional money for street improvement and storm sewers. The terms of the loan are 20 years at 5.125 percent interest. The combined water and sewer budget for the city for 1995 is $118,500, about half of which is water. This is approximately a 3 percent increase over the 1994 budget. The water service charge is $0.60/month and the usage rate is $2.20/1,000 gals/month. The average sewer and water bill is about $25.00 per month, with the larger share being the sewer charge. (The minimum sewer charge is $12.10/1000 gals/month compared to $2.80/1000 gals/month for water.) The city recently raised its water rates, and does not anticipate raising them again.

The FmHA has two programs to assist smaller communities with costs that might include those related to the maintenance of water tanks that have lead paint in the exterior coatings. One program, Water and Waste Disposal Loans and Grants, provides funds to public bodies for "...community water, sewer, storm sewer and solid waste systems." Following are some conditions of this program taken from a FmHA information sheet:

"- Service area must be under 10,000 in population.

- Applicant must be unable to borrow money elsewhere at rates and terms to make the project affordable.

- Loan interest rate depends upon the median household income of the borrower. The rate can be as low as 5 percent and will usually be no higher than commercial bond rates. Loan term is up to 30 years.

- Grants may be available if the income of the borrower is at or below $27,496 (per 1990 Federal census) and if needed to reduce annual costs of the system to what similar communities are paying.

- Repayment is by special assessments, user fees, or property taxes."

Further, the same information states, "Loan and grant funding has increased dramatically in the last few years as the need to finance clean water and a clean environment is seen as critical." Minnesota's loan and grant allocations for FY 1994 were $15.6 million and $8.4 million, respectively.

The second FmHA program is Community Facility Loans. These funds are for "essential community facilities with emphasis on health and safety" such as fire trucks, hospitals, and nursing homes, but also streets and community buildings. The conditions of this program are similar to those stated above, except that the "service area must be under 20,000 in population." Further, "those receiving first consideration will be the smaller projects in poorer communities." The loan allocation for Minnesota for FY 1994 was $4 million.

Of these two programs, Water and Waste Disposal Loans and Grants is more likely to provide assistance to a small community for repainting a water tank, because of the program guidelines and the much larger amount of money it has available. In addition, towns with populations less than 10,000 would be at a disadvantage competing with the larger number of eligible towns whose populations are less than 20,000. It is unknown at this time whether there will be increased competition for these grants and loans due to federal budget reductions.

Beyond the short-term costs of pollution control to local public bodies, removal of lead paint from steel structures, without adequate pollution control, is a serious danger to public and environmental health. The potential effects of lead contamination can be significant and can cause large monetary costs to local units of government. The determination of whether pollution control is cost effective must include an assessment of the costs associated with failure to use effective pollution control. Such costs also must be considered by local public bodies who are faced with the need to maintain steel structures. This point is stated too by Billings (1992) in the context of abatement of lead paint in residential structures (rf. 6).

The costs of remediation are real costs, like the costs for applying pollution control to lead paint removal projects. In 1990 the city of Cedar Park, TX, hired a contractor to repaint the water tank for $30,000. The paint on this standpipe contained 21 percent total lead, and no containment was used during dry abrasive blasting. Remediation included cleanup and blood lead testing. Extensive soil sampling and vacuum sampling of residential interiors was followed by HEPA vacuuming of yards, streets, rooftops, and drapes and replacement of soil, sod, carpet, roof shingles, and play equipment. Additional clearance sampling was also conducted. Blood lead testing involved 169 residents. The total cost of sampling and remediation to the city was about $1,000,000. This sum did not include the cost to the Texas Air Control Board, the Texas Department of Health, and the county health department, which exceeded 2,000 hours in staff time.

In 1991 a contractor sandblasted lead paint from a water tower in Fargo, ND, without pollution control. After soil sampling by the city, and the North Dakota Health Department, the city offered to strip and resod the front and back yards of 12 properties and to resod under the downspouts of 28 more houses. In addition, garden soils were removed and replaced. The cost to the city for this remediation was approximately $33,000.. This does not include the initial cost to the city of hiring a company to vacuum the visible deposits of material. Also not included are the costs of the sampling, and analysis to the state, and the costs of blood lead testing to the city health department.

The "long-term" costs of not confining and recovering lead paint particles released during removal of lead paint from steel structures can also include fines for violations of existing regulations. As an example, in 1992 the Kentucky Transportation Cabinet was fined $20,000 by the state Cabinet for Natural Resources and Environmental Protection for illegal handling and disposal of hazardous waste generated by sandblasting lead paint on a bridge. The highway department was cited for illegally storing hazardous sandblasting waste without a permit and for approving the burial of other sandblasting waste by the state contractor. Other DOT's also have been cited and penalized for violating environmental regulations in the course of bridge repainting projects.

IX. REVIEW BY COMMISSIONER OF TRANSPORTATION

Minn. Stat. § 174.05, requires the MPCA to inform the Commissioner of Transportation of all rulemakings that concern transportation, and requires the Commissioner of Transportation to prepare a written review of the rules. There has been both oral and written communication with MnDOT staff of the Office of Bridges and Structures and the Office of Environmental Services during this rulemaking. An early draft of the proposed rule was transmitted to the Commissioner on July 24,1992 (exh. 22). Subsequent drafts have been provided to MnDOT and written comments have been received from department staff and provided written response (exh. 23). A copy of the draft rule was sent from the Commissioner of the MPCA to the Commissioner of Transportation on September 6, 1994 (exh. 24).

X. LIST OF WITNESSES, EXHIBITS, AND REFERENCES

A. Witnesses

B. Exhibits

1. Report of Governor's "Lead Task Force: Final Report and Recommendations" (12/19/84).

2. SSPC presentation "Lead contamination of soil by sandblasting of bridges" (02/88).

3. Guidelines for removal of lead paint from bridges proposed to MnDOT (04/14/89).

4. Draft memorandum of agreement MPCA/MnDOT (12/15/89).

5. MnDOT statement re: interagency agreement (03/06/90).

6. MPCA staff recommendations to cities for lead paint removal (and cover letter) (03/15/90).

7. League of Minnesota Cities letter re: recommendations to cities (03/02/90).

8. MPCA staff recommendations to county engineers for lead paint removal (cover letter) (05/23/90).

9. Minnesota Counties (04/24/90) article re. recommendations to county engineers.

10. Minnesota Township News (03-04/90) article re: recommendations to cities.

11. State Register (05/14/90), Notice of Intent to Solicit Outside Information Regarding Proposed New Rules Regarding the Removal of Lead Paint from Residences, Bridges, and Water Towers.

12. Response letter from MnDOT Technical Services Division (06/14/90) to State Register notice of 05/14/90.

13. Minn. Rules pt. 7025.0010 to 7025.0080, Abrasive blasting of lead paint from residential, child care, and school buildings.

14. State Register (03/02/92), Notice of Intent to Solicit Outside Information Regarding Proposed New Rules Regarding the Removal of Lead Paint from Steel Structures.

15. Referral list for manufacturers of paint removal equipment and containment materials (05/92).

16. List of parties for technical review of draft rules (06/11/90 & 06/19/92).

17. State Register (12/21/92), Notice of Intent to Form Advisory Committee to Assist in the Review of New Rules Regarding the Removal of Lead Paint from Steel Structures.

18. Letter of invitation to interested parties to advisory committee meetings (01/21/93).

19. MPCA comments to EPA re. Title IV proposed regulations of 09/02/94 (11/21/94).

20. Survey of owners and contractors with form "Cost of lead paint removal from exterior steel surfaces" (11/05/93).

21. Cover letter to Commissioner of Department of Agriculture with copy draft rules (09/06/94).

22. Cover letter to Commissioner of MnDOT with copy draft rules (07/24/92)

23. MnDOT Office of Environmental Services comments on draft rules (03/21/94) and MPCA response to comments (04/14/94).

24. Cover letter to Commissioner of MnDOT with copy draft rules (09/06/94).

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XI. CONCLUSION

Based on the foregoing, the proposed Minn. Rules pts. 7025.0200 to 7025.0380 are both needed and reasonable.

Dated: 5/23/95

Charles W. Williams
Commissioner