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## Chapter 11 Environment and Worker Protection Regulations

### 11-1. Introduction

This chapter provides information on the controls necessary for environmental protection during paint removal operations. Details on the Federal regulations and a discussion of the means for complying with them are given. Note that state and local regulations can be more restrictive than the Federal regulations and must be researched before undertaking a paint removal project. Also be aware that the Government is responsible for assuring compliance with these regulations.

### 11-2. Development of Environmental and Worker Protection Regulations

*a.* Legislation passed by Congress is termed an Act of Congress. The responsibility for developing rules or regulations to implement the requirements of the Acts is given to various agencies of the Federal Government such as OSHA or USEPA. The proposed regulations developed by these agencies are published daily in the Federal Register; after publication, the public is permitted to review and comment on the proposed regulations. All comments are evaluated after the specified review time (30 days, 60 days, etc.) has passed. The comments may or may not result in changes to the proposed regulations, which are published in the Federal Register as the final rules.

*b.* The final rules from the Federal Register are compiled annually in the Code of Federal Regulations (CFR). The CFR is divided into 50 titles, numbered 1 through 50, which represent broad areas subject to Federal regulation. For example, Title 29 "Labor" contains the OSHA standards that govern the protection of workers; and Title 40 "Protection of the Environment" contains the USEPA regulations for the protection of the environment. Most CFRs applicable to industrial painting are updated every July 1; and, although they carry a July 1 date, typically are not printed and available until October or November of each year. References to the CFR's are made throughout this chapter. Copies of CFR's are not appended, but can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

*c.* The general format for identifying a specific regulation in the CFR involves the use of a combination of numbers and letters. For example, 40 CFR 50.12, "National Primary and Secondary Ambient Air Quality Standards for OSHA Lead" indicates that the regulation is found in

Title 40 of the CFR. It is further identified as part 50 (a part covers a specific regulatory area and can range in length from a few sentences to hundreds of pages). The number 12 that follows the decimal point indicates a given section where the specific information is found. A section also may range in length from a few sentences to many pages. Although not shown in this example, the section number may be followed by a series of letters and numbers in parentheses to further identify individual paragraphs.

*d.* The regulations discussed in this chapter are current at the time (1994) of writing. However, new regulations are being proposed and promulgated continuously. In addition, state or local regulations may be more restrictive than the Federal regulations and must be reviewed carefully before undertaking a project.

### 11-3. Worker Protection

Worker safety for general painting activities is discussed in Chapter 10. The requirements discussed in Chapter 10 are applicable to lead paint removal, but a number of specialized worker protection issues must be addressed as well. When outside contractors are used, they should provide plans and programs to address the appropriate items in this section. For in-house work, the facility owner should address these items for the protection of the owner's workforce. The determination of worker protection requirements for a specific jobsite must be guided by Federal requirements established under OSHA 29 CFR 1926.62, which became effective June 3, 1993. The development of the Interim Final Rule was mandated by Congress through Title X of the Housing and Community Development Act of 1992. A "Final" Comprehensive Health Standard for Lead in Construction at the state or Federal level has yet to be finalized. However, 29 CFR 1926.62 carries the full force of law and is enforceable in all states. Pertinent sections of 29 CFR 1926.62 are discussed below.

#### *a. Action level/missible exposure limit.*

(1) The OSHA 1926.62 standard requires that employers ensure that no employee is exposed to lead at concentrations greater than  $50 \mu\text{g}/\text{m}^3$  of air averaged over an 8-hour period. This level is defined as the Permissible Exposure Limit (PEL). If an employee is exposed to lead for more than 8 hours in any work day, provisions are included for reducing the PEL for that day. The PEL (employee's allowable exposure) as a time weighted average (TWA) is reduced according to Equation 11-1.

$$\text{Adjusted PEL } (\mu\text{g}/\text{m}^3) = \frac{400}{\text{hr in work day}} \quad (11-1)$$

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For example, for a 10-hour work day, the PEL is reduced to 40  $\mu\text{g}/\text{m}^3$ .

(2) The 29 CFR 1926.62 standard also established an action level at 30  $\mu\text{g}/\text{m}^3$ . This action level is the airborne concentration where certain provisions of the 29 CFR 1926.62 standard are invoked such as blood lead analysis, training, and hand washing facilities. Many of the provisions of 29 CFR 1926.62 apply if the exposure is below the action level. When respirators are used, the employee exposure for the periods in which the respirator is worn may be averaged with the exposure levels during the periods when respirators are not worn to determine the daily TWA exposure. For example, if the airborne concentration of lead in a work area is 500  $\mu\text{g}/\text{m}^3$  and the employee works for 4 hours in this area while wearing a half-mask respirator, the exposure during the 4 hours is 50  $\mu\text{g}/\text{m}^3$  (the protection factor of a half-mask respirator is 10, resulting in the employee exposure of 50  $\mu\text{g}/\text{m}^3$ ). If the remaining 4 hours are spent away from any lead exposure, and a respirator is not needed for any other purpose, the exposure for the remaining 4 hours is 0  $\mu\text{g}/\text{m}^3$ . The TWA exposure for the day is 25  $\mu\text{g}/\text{m}^3$ .

*b. Exposure assessment.*

(1) This section of 29 CFR 1926.62 requires that the employer initially establish whether the work environment (i.e., work activity) will result in an employee exposure to lead at or above the action level. This is accomplished by:

(a) Compiling exposure data the employer has collected within the past 12 months for similar operations conducted under similar work place conditions, environmental conditions, and work practices;

(b) Through objective data, demonstrating that the operation or activity cannot result in employee exposure at or above the action level; or

(c) Conducting monitoring consisting of personal samples representative of a full shift of the employee's regular, daily exposure to lead.

(2) When exposure monitoring is undertaken, at least one sample for each job classification in each work area is required for each shift (or for the shift with the highest exposure level). However, there are provisions in OSHA 1926.62 for reducing the initial determination to only a representative sample of employees reasonably believed to be exposed to the greatest airborne concentrations of lead (e.g., those conducting the abrasive blast cleaning) rather than for each job classification. But, if the initial limited determination shows the possibility of employee exposure at or above the action level, more extensive monitoring of each

job classification per shift is required.

(3) If the initial monitoring involves only the abrasive blast cleaners and the results are above the action level, representative monitoring of the exposure for each job classification (e.g., pot tenders, cleanup personnel, painters, etc.) must be conducted. Because industrial lead paint removal frequently leads to exposures well above the action level, employers often conduct the initial monitoring on all job classifications at the same time rather than monitoring only the expected highest exposures first.

(4) If the initial monitoring indicates that the exposure of all employees is below the action level, further monitoring need not be repeated unless there is a change in equipment, processes, control methods, or personnel or a new task is undertaken that may result in additional employees being exposed to lead at or above the action level.

(5) If the initial or subsequent determinations reveal employee exposure to be at or above the action level, but at or below the PEL, monitoring must be performed at least every 6 months and continued until at least two consecutive measurements, taken at least 7 days apart, are below the action level. At that time, monitoring can be discontinued unless any of the changes in work activities occur as discussed here.

(6) If the initial determination reveals exposure to be above the PEL, the monitoring is repeated at least quarterly. The quarterly monitoring continues until at least two consecutive measurements, taken at least 7 days apart, are at or below the PEL or below the action level, at which time the monitoring frequencies described here apply.

(7) Employees must be notified of all monitoring results within 5 working days after completion of the assessment. The results include the date of the determination, location of monitoring within the work site, and the name and social security number of each employee monitored. When the results are above the PEL, a statement must be included that the exposure was at or above that level as well as a description of the corrective action that was or will be taken to reduce the exposure.

(8) The method of monitoring used to determine the level of lead in the work environment requires attaching a portable, battery-operated pump to the worker's belt. A hose connects the pump to a filter positioned in the worker's breathing zone but outside any respiratory protective device. The pump draws air across the filter at a known rate to collect airborne particulate within the breathing zone throughout the work shift. The filter is removed and analyzed by a qualified laboratory in accordance with

NIOSH Method 7082, to determine the lead exposure.

(9) The monitoring can be conducted by a competent person, but it is recommended that the monitoring protocol and test results be reviewed by a certified industrial hygienist (CIH), certified by the American Board of Industrial Hygienists.

(10) The OSHA 29 CFR 1926.62 standard includes special provisions for the protection of employees during the time the initial monitoring of the exposures is undertaken. The OSHA standard divides work tasks into three categories: those anticipated to result in exposures above the PEL, but not in excess of 10 times PEL ( $500 \mu\text{g}/\text{m}^3$ ); those expected to be in excess of  $500 \mu\text{g}/\text{m}^3$ , but less than 50 times the PEL ( $2,500 \mu\text{g}/\text{m}^3$ ); and those expected to be in excess of  $2,500 \mu\text{g}/\text{m}^3$ . Activities anticipated by the OSHA standard to fall within each of the categories for the purposes of initial protection follow.

(a) Up to  $500 \mu\text{g}/\text{m}^3$ —manual demolition of structures with lead-containing coatings or paint (e.g., dry wall), manual scraping, manual sanding, heat gun applications, power-tool cleaning with dust collection systems, and spray painting with lead paint.

(b) Up to  $2,500 \mu\text{g}/\text{m}^3$ —using lead-containing mortar, lead burning, or conducting the following activities where lead-containing coatings or paint are present: rivet busting, power-tool cleaning without dust collection systems, cleanup activities for which dry expendable abrasives are used, and the movement and removal of abrasives blasting enclosures.

(c) More than  $2,500 \mu\text{g}/\text{m}^3$ —activities involving lead-containing coatings or paint on structures disturbed by abrasive blasting, welding, cutting, and torch burning.

(11) In each of the categories in paragraph 11-3b(10) above, the appropriate respiratory protection must be provided (with protection factors equal to or greater than 10X, 50X, and greater than 50X, depending on the exposure level). The OSHA 29 CFR 1926.62 standard requires additional protective measures as defined in a series of paragraphs (designated with lower case letters) throughout the standard. These measures include appropriate personal protective clothing and equipment used as described in paragraph (g); change areas and hand-washing facilities used as described in paragraph (i); biological monitoring made available in accordance with paragraph (j) consisting of blood sampling and analysis for lead and zinc protoporphyrin levels; and a certain level of the training required under paragraph (l). The training must include the portions of paragraph (l) which involve hazard communication (29 CFR 1926.59) and respiratory protection

(purpose, selection, fitting, use, and limitations). The training also must comply with 29 CFR 1926.21. After the results of the monitoring have been received, the respiratory and other protection requirements are modified accordingly.

*c. Methods of compliance.*

(1) The employer is required to implement engineering and work practice controls, including administrative controls, to reduce and maintain employee exposure to lead at or below the PEL. The OSHA 29 CFR 1926.62 standard indicates that these steps shall be taken to the extent such controls are feasible, although a definition of “feasible” is not provided. If the employee exposure is still above the PEL after all feasible engineering and work practice controls have been instituted, then (and only then) is respiratory protection used as described in paragraph (f) of the OSHA standard to ensure proper protection for the employee.

(2) The employer also is required to establish and implement a written compliance program prior to commencement of a project at which any employee may be occupationally exposed to lead at or above the PEL. The compliance program must include as a minimum the following.

(a) A description of each activity in which lead is emitted, including the equipment and materials involved, controls in place, crew size, employee job responsibilities, operating procedures, and maintenance practices.

(b) A description of the specific means used to control employee exposure to lead. When engineering controls are required, the engineering plans and studies used to determine the methods selected must be included. If mechanical ventilation is used to control lead exposure, the employer must evaluate its performance to maintain its effectiveness.

(c) A report of the technology considered in meeting the PEL.

(d) Air monitoring data that document the source of lead emissions.

(e) Detailed schedule for implementing the program.

(f) A work practice program that includes the protective work clothing and equipment to be used, housekeeping practices, and hygiene facilities and practices as well as other relevant work practices.

(g) An administrative control (job rotation) schedule, if appropriate, including the name and identification number of

each affected employee, the duration and exposure levels at each job where an employee is located, and any other information that may be useful in assessing the reliability of the administrative controls for reducing employee exposure to lead.

(h) A description of arrangements made among contractors on multicontractor sites with respect to informing other affected employees of potential lead exposures and the arrangements made for the respective responsibilities of the prime and/or subcontractor(s) for assuring full project compliance with the lead standard. Such arrangements are required in 29 CFR 1926.16 (e.g., the prime contractor may provide the shower facilities for use by all subcontractors).

(i) Other relevant information. The compliance program must provide for frequent and regular inspections by a competent person; the written programs must be available at the work site for examination and copying, and they must be completely accessible to any affected employee or authorized employee representative.

(3) The program is to be revised and updated at least every 6 months to remain current, and the employer also must ensure that employees follow good work practices such as those found in Appendix B of the OSHA 29 CFR 1926.62 lead standard.

*d. Respiratory protection.*

(1) The employer must provide respirators (at no cost to the employee) and ensure that they are used under the following circumstances.

(a) When the employee exposure to lead exceeds the PEL (even when engineering and work practices controls are used but are not sufficient to reduce exposures to below the PEL).

(b) When an employee requests a respirator.

(c) As the interim protection required for employees performing tasks identified in paragraph 11-3*b* while the monitoring is being undertaken.

(2) The respirator must be approved by MSHA and NIOSH.

(3) The respirator to be used is found in Table 11-1. The respirator is selected from Table 11-1 based on the airborne concentration of lead, although a powered, air-purifying respirator must be supplied in lieu of the respirator

specified in Table 11-1 if an employee chooses to use this type of respirator (if the powered air-purifying respirator provides adequate protection). The most significant impact of the information in Table 11-1 is that the traditional abrasive blasting helmet is stated to have a protection factor of 25X (up to 1,250  $\mu\text{g}/\text{m}^3$ ). Typical exposure in lead paint removal projects are many times in excess of this. (Note: ANSI Z88.2-1980 provided a protection factor of 1,000X for this same equipment.) An alternative to the traditional blasting helmet also is included in the Table 11-1. The type CE abrasive blasting respirator (full facepiece supplied air) operated in a positive-pressure mode is given a protection factor established of 2,000X the PEL.

(4) Employers are required to perform either qualitative or quantitative fit tests at the time of initial fitting of a respirator and at least every 6 months thereafter for each employee wearing a negative-pressure respirator. Appendix D of OSHA 29 CFR 1926.62 provides information on the qualitative fit tests (involving an odor or irritant smoke) which may be used only for half-mask respirators and quantitative fit tests. A quantitative fit test is required when other negative-pressure respirators are supplied (as full-face piece negative pressure). The quantitative fit test requires the use of a sophisticated machine to measure the amount of test material, if any, that leaks into the facepiece. It measures the protection factor for the respirator worn by the worker.

(5) If an employee exhibits difficulty breathing during the fitting test or during use, a medical examination in accordance with paragraph (j)(3)(i)(B) of OSHA 29 CFR 1926.62 shall be made available to the employee to determine whether the employee can wear a respirator while performing the required work activity.

(6) The employer also must institute a respiratory protection program in accordance with the following paragraphs of OSHA 29 CFR 1910.134: (b) "Requirements for a Minimal Acceptable Program," (d) "Air Quality," (e) "Use of Respirators," and (f) "Maintenance and Care of Respirators." Each employee must be permitted to change filter elements (when using a filter respirator) when an increase in breathing resistance is detected and be allowed to leave work areas to wash his face and the respirator facepiece when necessary to help prevent the skin irritation associated with its use.

(7) The respiratory protection program must include as a minimum the following:

(a) Written operating procedures for the selection and use of respirators.

**Table 11-1  
Respiratory Protection for Lead Aerosols<sup>a</sup>**

| Airborne Concentration of Lead or Condition of Use   | Required Respirator <sup>b</sup>  |
|--|---|
| Not in excess of 500 $\mu\text{g}/\text{m}^3$ .<br>(Protection - 10X)  | <ul style="list-style-type: none"> <li>• 1/2 mask air-purifying respirator with higher efficiency filters.<sup>c,d</sup></li> <li>• 1/2 mask supplied-air respirator operated in demand (negative pressure) mode.</li> </ul>  |
| Not in excess of 1,250 $\mu\text{g}/\text{m}^3$ .<br>(Protection - 25X)  | <ul style="list-style-type: none"> <li>• Loose-fitting hood or helmet powered air-purifying respirator with high efficiency filters.<sup>d</sup></li> <li>• Hood or helmet supplied-air respirator operated in a continuous-flow mode—e.g., type CE abrasive blasting respirators operated in a continuous-flow mode.</li> </ul>  |
| Not in excess of 2,500 $\mu\text{g}/\text{m}^3$ .<br>(Protection - 50X)  | <ul style="list-style-type: none"> <li>• Full facepiece air-purifying respirator with high efficiency filters.<sup>d</sup></li> <li>• Tight-fitting powered air-purifying respirator with high efficiency filters.<sup>d</sup></li> <li>• Full facepiece supplied-air respirator operated in demand mode.</li> <li>• 1/2 mask or full facepiece supplied-air respirator operated in a continuous-flow mode.</li> <li>• Full facepiece self-contained breathing apparatus (SCBA) operated in demand mode.</li> </ul> |
| Not in excess of 50,000 $\mu\text{g}/\text{m}^3$ .<br>(Protection 1,000X)  | <ul style="list-style-type: none"> <li>• 1/2 mask supplied-air respirator operated in pressure demand or other positive-pressure mode.</li> </ul>   |
| Not in excess of 100,000 $\mu\text{g}/\text{m}^3$ .<br>(Protection 2,000X)   | <ul style="list-style-type: none"> <li>• Full facepiece supplied-air respirator operated in pressure demand or other positive-pressure mode—e.g., type CE abrasive blasting respirators operated in a positive-pressure mode.</li> </ul>  |
| Greater than 100,000 $\mu\text{g}/\text{m}^3$ unknown concentration, or fire fighting.<br>(Protection over 2,000X) | <ul style="list-style-type: none"> <li>• Full facepiece SCBA operated in pressure demand or other positive-pressure mode.</li> </ul>  |

<sup>a</sup> OSHA 29 CFR 1926.62.

<sup>b</sup> Respirators specified for higher concentrations can be used at lower concentrations of lead.

<sup>c</sup> Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.

<sup>d</sup> A high efficiency particulate filter (HEPA) means a filter that is 99.97 percent efficient against particles of 0.3 micron size or larger.

(b) Written verification that respirators are selected on the basis of the hazards to which the worker is exposed.

(c) Instruction and training on the proper use of respirators and their limitations (training must include fitting instructions and demonstrations on how the respirator is worn and adjusted and methods to determine if it fits properly).

(d) Regular cleaning and disinfecting of the respirators.

(e) Proper storage of respirators in convenient, clean, sanitary locations.

(f) Routine inspection of respirators during cleaning and replacement of worn and deteriorated parts.

(g) Appropriate surveillance of work area conditions and the degree of employee exposure.

(h) Regular inspection and evaluation of the program to determine its continued effectiveness.

(i) A physician's review to determine if the employee is physically able to conduct the work while using a respirator.

(j) The use of respirators approved only by MSHA and NIOSH.

*e. Protective work clothing and equipment.*

(1) The employer is required to provide (at no cost to the employee) and to ensure its use appropriate protective work clothing and equipment that prevents contamination of the employee and the employee's garments:

(a) When an employee is exposed to lead above the PEL,

(b) When an employee is exposed to lead compounds that may cause skin or eye irritations (e.g., lead arsenate, lead azide), and

(c) As an interim protection for employees performing the specific tasks identified in paragraph 11-3b(10) while the

initial exposure monitoring is being undertaken.

(2) The clothing includes, but is not limited to, coveralls or similar full-body work clothing; gloves, hats, shoes, or disposable shoe coverlets; and face shields, vented goggles, or other appropriate protective equipment that complies with OSHA 29 CFR 1910.133.

(3) The clothing must be provided in a clean and dry condition at least weekly when airborne exposures are less than 200  $\mu\text{g}/\text{m}^3$  as an 8-hour TWA, or daily if exposures are greater than 200  $\mu\text{g}/\text{m}^3$ .

(4) The employer is required to ensure that the protective clothing is removed at the completion of the work shift in appropriate change areas per paragraph (i) of OSHA 29 CFR 1926.62 lead standard; that clothing to be cleaned, laundered, or disposed of is placed in closed containers in the change area that prevents dispersion of lead outside the container; that lead is not removed from clothing or equipment by blowing, shaking, or other means that disperses the lead; and that persons who clean or launder the clothing are advised of the potential harmful effects of lead and the containers are labeled as follows: CAUTION: CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS.

*f. Housekeeping.*

(1) OSHA 29 CFR 1926.62 requires that all surfaces be maintained as free as practicable of accumulations of lead, and that floors and other surfaces where lead accumulates be cleaned, when possible, by vacuum or other methods that minimize the likelihood of the lead becoming airborne. Vacuums are to be equipped with HEPA filters. Only when these methods have been tried and been found to be ineffective can shoveling, dry or wet sweeping, or brushing be used. The OSHA standard prohibits the use of compressed air for removing lead from any surface unless it is used in conjunction with a ventilation system designed to capture the airborne dust created by the compressed air.

(2) The use of compressed air to blow-down surfaces within a ventilated containment would be acceptable if the ventilation system is adequate. However, the use of compressed air for housekeeping outside the ventilated containment is prohibited.

*g. Hygiene facilities and practices.* The employer must ensure that food or beverages are not present or consumed, tobacco products are not present or used, and cosmetics are

not applied within any areas where the lead exposure is above the PEL.

(1) Hand-washing facilities in accordance with paragraph (f) of OSHA 29 CFR 1926.51 must be provided for employees exposed to lead regardless of its concentration.

(2) Clean change areas must be provided for employees whose airborne exposure is above the PEL and for employees performing the tasks described in paragraph 11-3b(10) while the exposure monitoring is underway. The change areas must be equipped with storage facilities for protective work clothing and equipment that is separated from the storage of street clothes to prevent cross-contamination. Employees are not permitted to leave the work place wearing protective clothing or equipment that was worn during the work shift.

(3) Lunchroom facilities or eating areas are to be provided for employees with an airborne exposure to lead above the PEL, and the facilities or areas are to be maintained as free as practicable from lead contamination. Employees are required to wash their hands and face prior to eating, drinking, smoking, or applying cosmetics. Employees are not permitted to enter the lunchroom or eating areas wearing their protective work clothing or equipment unless the surface lead dust has been removed by vacuuming, downdraft booth, or other cleaning methods that limit its dispersion. Thus, the clothing need not be removed at lunch or for breaks if the surface dust has been thoroughly removed.

(4) Showers are required, where feasible, for use by employees with an airborne exposure to lead above the PEL. OSHA 29 CFR 1926.62 does not provide a definition of "feasible"; it states that, when shower facilities are available, employees must shower at the end of the work shift. If showers are not provided, employees must wash their hands and face at the end of the work shift. (Note: Because of the high dust and lead exposure generated during removal of lead paints by methods such as abrasive blast cleaning, showers are an important element in assuring proper hygiene.)

*h. Medical surveillance.*

(1) The medical surveillance provisions of OSHA 29 CFR 1926.62 consist of two parts, periodic biological (blood) monitoring and medical examinations. The employer must make all of the medical surveillance provisions available, but the OSHA standard does not require that the employee participate, although it is strongly recommended. All medical examinations and procedures

must be performed by or under the supervision of a licensed physician. All medical surveillance required by the OSHA standard must be made available to the employee (including multiple physician review), without cost to the employee and at a reasonable time and place.

(2) The biological monitoring consists of blood lead analysis and zinc protoporphyrin (ZPP). The blood lead level is assessed as micrograms of lead per deciliter of whole blood ( $\mu\text{g}/\text{dl}$ ). These units are essentially equivalent to micrograms per 100 grams of blood. The ZPP test measures an adverse metabolite of lead, and as such it may be a better indicator of lead toxicity than the level of blood lead itself. The level of ZPP reflects lead absorption over the preceding 3 to 4 months, and it does not fluctuate over short time spans as blood lead levels do. Many investigators believe ZPP is the most reliable means of monitoring chronic lead absorption and that its value will increase as more data are collected regarding its relationship to other manifestations of lead poisoning.

(3) Initial medical surveillance must be made available to employees who are exposed on any day to lead at or above the action level. This surveillance consists only of the biological monitoring in the form of blood analysis for lead and ZPP.

(4) When employees are exposed to lead at or above the action level for more than 30 days in any consecutive 12 months, the medical surveillance program that must be made available consists of both the blood analysis per paragraph (j)(2) "Biological Monitoring" of OSHA 29 CFR 1926.62 and medical examinations per paragraph (j)(3) "Medical Examinations and Consultations" of the same standard.

(5) For each employee exposed at or above the action level for more than 30 days in any consecutive 12 months, the blood lead and ZPP level testing must be made available at the following frequency.

(a) At least every 2 months for the first 6 months of exposure, and every 6 months thereafter.

(b) For any employee whose analysis indicates a blood lead level at or above  $40 \mu\text{g}/\text{dl}$ , the test frequency is at least every 2 months. Testing continues at this 2-month frequency until two consecutive results indicate a blood level less than  $40 \mu\text{g}/\text{dl}$ , at which time the 6-month testing interval is resumed.

(c) For employees with a single blood lead level at or above  $50 \mu\text{g}/\text{dl}$ , a second test must be provided within 2 weeks after the results of the first test are received. If the

second test is at or above  $50 \mu\text{g}/\text{dl}$ , the worker must be removed from exposure to lead above the action level, the medical removal provisions of paragraph (k) of OSHA 29 CFR 1926.62 are invoked, and the sampling and analysis are undertaken at least monthly during the period of removal.

(6) Within 5 working days after receipt of the biological monitoring results, the employer must notify each employee in writing of the results. For employees with blood lead levels exceeding  $40 \mu\text{g}/\text{dl}$ , the notification also must advise the employee of the medical removal and protection provisions of OSHA 29 CFR 1926.62 as described in its paragraph (k) if their blood lead level increases to  $50 \mu\text{g}/\text{dl}$ .

(7) Medical examinations and consultations must be made available for employees exposed to lead at or above the action level for more than 30 days in any consecutive 12 months under the following conditions:

(a) Preassignment. The requirement for a preassignment medical examination is somewhat ambiguous in OSHA 29 CFR 1926.62, but the intent to require a preassignment examination is made clear in Appendix B of this standard.

(b) At least annually for each employee for whom a blood sampling test conducted at any time during the preceding 12 months indicated a blood lead level at or above  $40 \mu\text{g}/\text{dl}$ .

(c) As soon as possible on notification by an employee that signs or symptoms commonly associated with lead intoxication are occurring, that the employee desires medical advice concerning the effects of past or present lead exposure on the ability to procreate a healthy child, that the employee is pregnant, or if the employee has demonstrated difficulty in breathing during a respirator fitting test or during use of a respirator.

(d) As medically appropriate for each employee who has had limits placed on his or her lead exposure or has been removed from lead exposure as dictated by the medical removal protection provisions of paragraph (k) of OSHA 29 CFR 1926.62.

(8) The content of the medical examinations is at the discretion of the examining physician, but if requested by the employee, must include testing to determine if the employee is pregnant or laboratory evaluation of male fertility. The examination must include:

(a) A detailed work history and medical history, with particular attention to past lead exposure.



(b) A thorough physical examination, including an evaluation of pulmonary status if respiratory protection will be used.

(c) A blood pressure check.

(d) A blood sample and analysis that determines blood lead level, ZPP, hemoglobin, hematocrit, red cell indices, peripheral smear morphology, blood urea nitrogen, and serum creatinine.

(e) A routine urinalysis.

(f) Any other test relevant to lead exposure that the physician deems necessary.

(9) Physicians are to be provided with a copy of OSHA 29 CFR 1926.62 and all appendices, a description of the employee's duties, the employee's exposure level or anticipated exposure level to lead or other toxic substance (if applicable), a description of the personal protective equipment to be used, prior blood lead determinations, and all prior written medical opinions concerning the employee that are in the employer's possession or control.

(10) If the employer selects the initial physician, the employee may designate a second physician to review the findings and to conduct any examinations, consultations, and laboratory tests deemed necessary to facilitate the review. The employee shall be notified of this right to seek a second medical opinion. (The employer often requires notification within 15 days that a second opinion will be sought.) If the opinion of the two physicians differ and cannot be resolved, the employer and employee must designate a third physician to conduct a review. The employer must accept the findings of the third physician, unless the employer and employee reach an agreement that is consistent with the recommendations of at least one of the three physicians.

(11) The employee must be provided with a written copy of the medical opinion from each physician, including the physician's opinion about whether a medical condition was detected that would increase the risk of impairment to health because of exposure to lead, any recommended special protective measures needed or limitations to be placed on the employee's lead exposure, any recommended limitation on the use of respirators, and the results of blood lead determinations. Any findings, laboratory results, or diagnosis unrelated to the employee's occupational exposure to lead must not be revealed to the employer either in writing or orally.

(12) The employer must assure that prophylactic chelation (to reduce an existing high blood lead level or to prevent an elevation in blood lead) does not occur at any

time, unless it is done under the supervision of a licensed physician in a clinical setting. The employee also must be notified in writing prior to any treatment.

*i. Medical removal protection.*

(1) Employees must be removed from work involving an exposure to lead at or above the action level under the following conditions.

(a) When the results of a single blood test and a follow-up test, conducted within 2 weeks of receiving the results of the first test, are at or above 50 µg/dl. The employee may be returned to former job status when two consecutive blood tests indicate the blood lead level is at or below 40 µg/dl. (Blood tests are required at least monthly during the medical removal period.)

(b) When a final medical determination (written medical opinion by the examining physicians' or the outcome of multiple physicians review) results in a determination that the employee has a medical condition that if exposed to lead, increases the risk of material impairment to his or her health. The employee can be returned to former job status when a subsequent medical determination indicates that the detected medical condition no longer exists.

(2) An exception to removal based on the risk to health addressed in paragraph 11-3i(1)(b) above, can occur if the physician recommends special protective measures or limitations on the exposure to lead rather than the removal of the worker from lead exposure. In this situation the employer must act consistent with the recommendation. The special protective measures or limitations can be ended when a final medical determination indicates that the measures are no longer necessary.

(3) The requirement that the employee be returned to former job status after medical removal is not intended to expand on, or restrict, any rights the employee has or would have had to a specific job classification or position under the terms of a collective bargaining agreement. This significant point regarding worker medical removal protection is illustrated by the following example, which is found in the preamble to OSHA 29 CFR 1926.62: "... where an employee's job is concluded while the employee is on medical removal, the employee is not entitled to continuing medical removal protection benefits or to the job, since if the employee had not been removed, the employment would have ended in any case."

(4) On each occasion that the employee is removed from exposure to lead, the employer shall provide the employee with up to 18 months of medical removal protection

benefits. This means that, as long as the job the employee was removed from continues, the employer shall maintain the total normal earnings, seniority, and other employment rights and benefits of the employee, including the employee's right to his or her former job status as if the employee had not been removed or otherwise medically limited.

(5) If the removed employee files a claim for Workers' Compensation payments for lead-related disability, the employer still must continue to provide medical removal protection benefits pending disposition of the claim. If the employee is paid for lost earnings under Worker's Compensation during the period of removal, the employer's medical removal protection obligation under OSHA 29 CFR 1926.62 is reduced by that amount. The employer's financial obligation also is reduced by any compensation the employee receives for lost earnings either from a publicly or employer-funded compensation program, or if the employee receives income from other employment that was made possible because of the employee's removal from lead work.

(6) When an employer removes an employee from exposure to lead or otherwise places limitations on the employee because of the potential health effects of lead exposure, and does so voluntarily (i.e., was not required to do so as a result of elevated blood lead or a final medical determination), the medical removal protection benefits of OSHA 29 CFR 1926.62 still apply.

*j. Employee information and training.*

(1) All employees exposed to lead are to be trained on lead hazards in accordance with the requirements of OSHA 29 CFR 1926.59. Note: The OSHA Compliance Directive issued December 13, 1993, acknowledged that training in OSHA 29 CFR 1926.59 was not applicable to the lead standard because OSHA 29 CFR 1926.59 addresses materials brought onto the jobsite and would only apply if lead paint was being applied. For the removal of pre-existing paint, OSHA 29 CFR 1926.62 identifies the appropriate precautions. In addition, employees exposed to lead at or above the action level on any day, or who are exposed to lead compounds that may cause skin or eye irritation (e.g., lead arsenate, lead azide), must be provided with a comprehensive training program and required to participate. The lead training program must be given prior to the job assignment and repeated at least annually.

(2) The specific training program for lead exposure as required by OSHA 29 CFR 1926.62 must include the following:

(a) The content of OSHA 29 CFR 1926.62 and its appendices.

(b) The specific nature of the operations that could result in exposure to lead above the action level.

(c) The purpose, proper selection, fitting, use, and limitation of respirators.

(d) The purpose and explanation of the medical surveillance and medical removal protection programs.

(e) Information concerning the adverse health effects associated with excessive exposure to lead, with particular attention to the adverse effects on both male and female reproductive systems, as well as additional precautions for employees who are pregnant including hazards to the fetus.

(f) The engineering controls (e.g. ventilation inside containment) and work practices (e.g. proper hygiene) associated with the employee's job assignment including instructions to follow the good work practices that are described in Appendix B of OSHA 29 CFR 1926.62.

(g) The contents of any compliance plan in effect.

(h) Instructions to employees that chelating agents must not be used except under the direction of a licensed physician, and under no circumstance should they be used routinely for the removal of lead.

(i) The employee's right of access to records under OSHA 29 CFR 1910.20.

(3) A copy of OSHA 29 CFR 1926.62 and its appendices must be made available to all affected employees. Materials relating to employee information and training shall be provided upon request to employees, their designated representative, to the Assistant Secretary of OSHA and the Director of NIOSH.

*k. Signs.*

(1) The employer shall post warning signs in each work area where an employee's exposure to lead is above the PEL. The legend is as follows:

WARNING  
LEAD WORK AREA  
POISON  
NO SMOKING OR EATING

(2) The warning signs must be illuminated and cleaned when necessary to assure that the words are visible. No statements are to be placed on or near any warning sign that contradict or detract from the meaning of the sign.

(3) Although not required by OSHA 29 CFR 1926.62, the area encompassed by the signs (the area in which the PEL is exceeded) may be isolated with rope or tape and termed a "regulated area." Untrained and unprotected personnel are not permitted to pass beyond the barrier. The regulated area is also often established at the boundary defined by the action level instead of the PEL, since the action level triggers that certain mandatory measures are required (e.g., blood lead analysis and training).

*l. Recordkeeping.* The employer is required to maintain a series of records on exposure assessments, medical surveillance, workers removed from lead exposure for medical reasons (medical removals), and any data used for requiring an exemption from the initial exposure monitoring required in paragraph (d) of OSHA 29 CFR 1926.62. The records include the following:

(1) Exposure assessment.

(a) All monitoring and other data used in conducting employee exposure assessments.

(b) The exposure monitoring records including the date(s) of monitoring, monitoring duration, location of the work monitored, and the results of each of the samples taken. If each employee was not individually monitored, the records must include a description of the procedure used to establish that the employees who were monitored were representative of the exposures of the other employees. The names, social security numbers, and job classifications of the employees monitored and of all other employees whose exposure the measurement is intended to represent must be provided. The sampling and analytical methods used, evidence of their accuracy, and the type of respiratory protective devices worn (if any) must be documented. Any environmental variables that could affect the measurement of employee exposure are to be included.

(c) The monitoring and other exposure assessment records are to be maintained in accordance with the provisions of OSHA 29 CFR 1910.20, which requires that employee exposure records be preserved and maintained for at least 30 years.

(2) Medical surveillance. Exceptions to the 30-year record retention period include health insurance claims records that are maintained separately, first aid records,

and medical records of employees who have worked for less than 1 year for the employer. Records for employees who have worked less than 1 year need not be retained beyond the term of employment if a copy is given to the employee on termination of employment.

(a) The employer is required to maintain accurate records for each employee subject to medical surveillance as required by paragraph (j) of OSHA 29 CFR 1926.62.

(b) The records must include the name, social security number, description of duties of the employee, and a copy of the physicians' written opinions. The results of any airborne exposure monitoring done on or for the employee that were provided to the physician must be included as well as any employee medical complaints related to exposure to lead.

(c) The employer must keep, or ensure that the examining physician keeps, a copy of the medical examination results, including the medical work history of the employee, a description of the laboratory procedures used, a copy of any standards or guidelines used to interpret the test results (or references to the information), and a copy of the results of the biological monitoring.

(d) The employer must maintain, or ensure that the physician maintains, the medical records in accordance with the provisions of OSHA 29 CFR 1910.20. OSHA 29 CFR 1926.62 requires that medical records for each employee be preserved and maintained for at least the duration of employment plus 30 years.

(3) Medical records.

(a) The employer must maintain accurate records for each employee removed from exposure to lead due to the requirements of paragraph (k) of OSHA 29 CFR 1926.62.

(b) The records must include the name and social security number of the employee, the date of each occasion the employee was removed from exposure to lead and the return date, a brief explanation of how each removal from exposure is being or was accomplished, and a statement indicating whether or not the removal from lead exposure was because of an elevated blood lead level.

(c) The employer must maintain each medical removal record for at least the duration of the employee's employment.

(4) Objective data for exemption from the requirement for initial exposure monitoring.

(a) Information demonstrating that a particular product or material containing lead (e.g. a particular paint), or a specific process, operation, or activity (e.g. hand-tool cleaning) cannot release lead dust or fumes in concentrations at or above the action level must be maintained if the data were used as the basis for an exemption from initial exposure monitoring. The objective data can be obtained from an industry-wide study, but the workplace conditions used during the study must closely resemble the processes, types of materials, control methods, work practices, and environmental conditions in the current operations they are intended to represent.

(b) The employer must maintain the record of the objective data for at least 30 years. All records must be made available on request to affected employees, former employees, their designated representatives, and the Assistant Secretary of OSHA and the Director of NIOSH for examination and copying. If an employer ceases to do business, the successor employer is required to receive and retain all records. When there is no successor employer, the records must be transmitted to the Director of NIOSH. When the retention period for the records expires, the employer must notify the Director of NIOSH at least 3 months prior to the disposal of the records and transmit them to the Director of NIOSH if requested. The employer also must comply with additional requirements involving transfer of records as set forth in OSHA 29 CFR 1910.20, paragraph (h) "Transfer of Records."

*m. Observation of monitoring.*

(1) Affected employees or their designated representatives must have the opportunity to observe any monitoring of employee exposure to lead. When the observation of monitoring requires entry into areas requiring the use of respirators, protective clothing, or equipment, the employer must provide the observer with the equipment and ensure that it is used; also, the observer is required to comply with all other applicable safety and health procedures.

(2) The observers are not permitted to interfere with the monitoring; but they are entitled to receive an explanation of the measurement procedures, to observe all steps related to the monitoring of lead, and to record the results obtained or receive copies of the results when they are returned by the laboratory.

#### 11-4. Air Quality Regulations

*a. National Ambient Air Quality Standards (NAAQS) for particulate matter.* EPA 40 CFR 50.6 requires the measurement of particulate matter in the ambient air as

PM10 [particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers ( $\mu\text{m}$ )]. Emissions cannot exceed  $150 \mu\text{g}/\text{m}^3$ , 24-hour average concentration. Another value,  $50 \mu\text{g}/\text{m}^3$ , annual arithmetic mean is also established in EPA 40 CFR 50.6. This type of monitoring is designed to protect against the inhalation of any particulate matter (not just lead or hazardous material) that is of a respirable size.

*b. NAAQS for lead.* Lead emissions are addressed in EPA 40 CFR 50.12. The criterion is  $1.5 \mu\text{g}/\text{m}^3$ , maximum arithmetic mean averaged over a calendar quarter. This assessment is based on an analysis of total suspended particulate (TSP) in the air.

*c. Limitation and use of NAAQS on paint removal projects.* Although ambient air quality standards for paint removal exist, they are not consistently imposed on paint removal projects. This type of standard usually is for the continuous, long-term monitoring of large areas (e.g., entire cities) as compared to individual short-term projects, and these standards are not designed for assessing emissions from a single source such as a dome. Despite the shortcomings, ambient air monitoring is being specified on some paint removal projects, and the NAAQS criterion (often with some modifications) is being invoked.

*d. Air monitoring procedures.*

(1) Monitoring may be initiated when there is a belief that emissions from a short-term paint removal project (particularly lead) could have an effect on the overall air quality in a region. Monitoring also may be imposed to better assure public health and welfare when the lead paint removal site is in a residential area or next to schools, hospitals, playgrounds, and other areas of public access. For work already underway, complaints over visible emissions or questions about the seriousness of emissions could be investigated with monitors. Prior litigation over emissions also may trigger monitoring on future projects. For example, monitoring has been required in Allegheny County, PA since 1987 for most abrasive blast-cleaning projects greater than  $930 \text{ m}^2$  (10,000 sq ft) in area as a result of earlier litigation over silica contamination.

(2) The decision regarding whether to monitor a given project is not clear-cut. However, if there is a potential for public exposure to the dust, monitoring will provide a high degree of assurance that any emissions are within acceptable limits. Without monitoring, judgment calls are strictly subjective. For work within the confines of a plant when it can be established that dust and debris will not carry across the property line into a community, monitoring will provide little benefit. However, verification about the transport of

the dust and debris might require monitoring for a few days at project start-up. If the monitoring shows that the emissions do not carry into the community, facility owners might use only personal monitors (which determine worker exposures for OSHA purposes; see paragraph 11.3a) to establish a restricted or regulated area around the work site to avoid potential harm to other workers in the area.

*e. Establishing daily criterion for air monitoring.*

(1) Particulate matter.

(a) If NAAQS is appropriate for a given project, one difficulty in imposing its requirements is that the criterion for PM<sub>10</sub> is established on a 24-hour basis (rather than 8 hours or less, as is the typical duration of a paint removal operation). The SSPC guide GI(Con), "Guide for Containing Debris Generated During Paint Removal Operations," provides suggestions for converting the criterion to a daily value, but this guide cautions that local air quality officials should be contacted for approval.

(b) For PM<sub>10</sub> analysis, SSPC Guide GI(Con) suggests that 450 µg/m<sup>3</sup> over an 8-hour period may provide a rational method for applying the NAAQS criterion, if no emissions occur from the project site for the remaining 16 hours. This would be equivalent to 150 µg/m<sup>3</sup> for a 24-hour period.

(2) Lead. The NAAQS criterion for lead is 1.5 µg/m<sup>3</sup> based on a quarterly (90-day) average. SSPC guide GI(Con) suggests using two formulas for converting the quarterly average to a daily allowance based on the number of days out of 90 expected to be worked, and on the number of hours to be worked within a day. For example, if a project is expected to require 30 days of blast cleaning of the 90-day period, the first formula would permit 4.5 µg/m<sup>3</sup> of lead in each of the 30 days. If there are no emissions in the remaining 60 days, the average is 1.5 µg/m<sup>3</sup> for the quarter. If the blast cleaning involves 8 hours per day, the formulas would suggest a maximum allowable lead emission of 13.5 µg/m<sup>3</sup> for the 8-hour day if there are no emissions for the remaining 16 hours. The result is less than the maximum of 4.5 µg/m<sup>3</sup> for the day.

*f. Placement of monitors.*

(1) Guidance for positioning the monitors is found in Appendix E of EPA 40 CFR 58 where lead is addressed in item 7 and PM 10 is addressed in item 8.

(2) The approach used for monitor placement in Allegheny County, PA, has been reported by Sadar and Patel (1987). Information from this article and the CFRs

provides some guidance on monitor placement, but many lead paint removal projects are located over heavily travelled highways or near trees and other obstructions, and the ideal criteria for monitoring may be difficult to comply with in all situations. And, considerable judgment is required for the selection of placement sites. Wind speed and velocity; proximity to homes, neighborhoods, and areas of public access; and the effects of the surrounding terrain are only a few items to be considered. Therefore the value of any monitoring should be evaluated before it is specified.

*g. Duration of monitoring.*

(1) EPA 40 CFR 58.13 identifies the frequency of monitoring required (daily, every other day, etc.). EPA 40 CFR 58.13 is written for the long-term, continuous (permanent) monitoring at sites across the Nation to establish air quality data. As a result, there is no guidance on the duration of monitoring for short-term projects such as paint removal. However, industry experience shows the monitoring to follow one of four approaches:

(a) Continual monitoring throughout the entire project independent of the results (this would be the only acceptable method if strict compliance with the NAAQS is specified).

(b) Monitoring only when the work is in proximity to areas of public access (when the work is near a riverbank, but not while it is in the center of the river).

(c) Monitoring during the initial week or two of the project to establish the suitability of the methods used to control emissions; if acceptable, the frequency of monitoring is reduced or eliminated and resurrected only when problems appear to be occurring as determined by visual assessments.

(d) Monitoring only when complaints are received regarding visible emissions or questions are raised about the nature of the emissions.

*h. Baseline monitoring.* Adequate monitoring before a paint removal operation is undertaken will establish background levels. Depending on the variability of the results, continuous upwind, background monitoring may be required.

*i. Volatile organic compounds (VOCs).*

(1) Clean Air Act and Amendments.

(a) The Clean Air Act and the Clean Air Act Amendments of 1990 are affecting the coatings industry by restricting the amount of VOCs that can be emitted during

coating application (e.g., it impacts the solvents content allowed in the coating being applied).

(b) The portions of the Code of Federal Regulations addressing the Clean Air Act are found in 40 CFR Subchapter C "Air Programs" covering parts 40 CFR 50 through 40 CFR 99. The 1990 Amendments to the Clean Air Act can be obtained from Federal, state, or local EPAs.

(2) Definition of VOCs and cause for concern.

(a) VOCs are defined by the EPA as a group of chemicals that react in the atmosphere with nitrogen oxides in the presence of heat and sunlight to form ozone. Ozone in the lower atmosphere also is known as smog, a pollutant detrimental to plants and humans. The National Air Quality Standard for ozone is found in EPA 40 CFR 50.9, which establishes a level of 0.12 ppm maximum hourly average concentration. Areas that exceed this level more than once per year are termed nonattainment areas, with further classification as marginal, moderate, serious, severe, and extreme (e.g., extreme is far above the limit at 0.28 ppm and greater). A city or area has a certain number of years (ranging from 3 to 20) to bring the ozone level into compliance. The higher the existing level (e.g., extreme), the longer the time period for compliance.

(b) Because emissions from coatings (solvents in particular) can contribute to the formation of ozone in the lower atmosphere, the EPA has been directed to regulate VOCs. In the 1970's, the EPA issued control technique guidelines (CTG) for VOCs in coatings for miscellaneous metal parts. The CTG apply to nonattainment areas and are intended to provide guidance for the state and local agencies on VOC emissions from fabricating shops and other fixed-facility operations. Although the CTG are for guidance only, state and local agencies must develop rules that are at least as strict as those found in the CTG.

(3) Variance in VOC restrictions.

(a) The restrictions on VOCs per gallon of paint vary according to the category of coating and its usage, but maximums generally range from 340 grams per liter (g/L) (2.8 pounds/gallon [lb/gal]) to 420 g/L (3.5 lb/gal). In some jurisdictions, there are exemptions for specific types of coatings or for coatings used for specific applications in which higher VOC levels are allowed. There also is work underway to further reduce the level of VOCs in all coatings.

(b) A national VOC rule on Architectural and Industrial Maintenance (AIM) coating applied to stationary sources is being developed. Under a tentative agreement, industrial

maintenance coating would be restricted to a maximum of 350 g/L (2.9 lb/gal) as applied. Tentative levels also have been established for approximately 50 other categories and subcategories of coating. The national rule as currently envisioned would become increasingly more restrictive in 1996, 2000, and 2003. Reduction is scheduled for 25 percent by 1996, 35 percent by 2000, and 45 percent by 2003.

(4) VOC as manufactured versus "as applied." When investigating acceptable coatings, the VOC "as applied" counts rather than the VOC "in the can." For example, a solvent-based coating containing 340 g/L (2.8 lb/gal) VOC in the can that must be thinned 10 percent for application will exceed the 340 g/L (2.8 lb/gal) threshold at the time of application. If the local regulations restrict the use of materials to those containing 340 g/L (2.8 lb/gal) or less, the coating given in the example could not be used.

(5) Other coating restrictions. In addition to restrictions associated with VOC, precaution must be taken when using other materials that may be hazardous to humans. Pigments that can be toxic include lead, chromium, barium, cadmium, mercury, and others as described in paragraph 11-7. Almost all paint manufacturers have removed toxic pigments such as lead from their products, and many good alternatives are available. Some solvents used in paints, such as ethylene glycol ethers, also are being avoided because of toxicity. MSDS for all candidate paint materials should be thoroughly reviewed before specifying a product. The American Industrial Hygiene Association can provide information on the potential health effects of various elements and solvents.

## 11-5. Water Quality Regulations

*a. 40 CFR Subparts D, Parts 100-149.* The portions of the Code of Federal Regulations that address the Clean Water Act are found in 40 CFR Subchapter D "Water Programs" and encompass Parts 100 through 149. EPA 40 CFR 116 lists substances that are designated as being hazardous under the Clean Water Act.

*b. Reportable quantities.* The reportable quantities of hazardous substances that would result in a violation of the Clean Water Act are found in EPA 40 CFR 117, Table 117.3, "Reportable Quantities of Hazardous Substances Designated Pursuant to Section 311 of the Clean Water Act." Table 117.3 indicates the maximum amount of the substance that can be discharged in a 24-hour period. In the case of the various forms of lead listed in the table, the reportable quantities range from 0.453 to 2,265 kilograms (kg) (1 to 5,000 lb) over a 24-hour period. The type of lead found in paint is not specifically listed in Table 117.3, but a reportable quantity of lead (which would

include paint pigments) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is 10 lb (4.5 kg) in a 24-hour period. CERCLA reporting is addressed in paragraph 11.7a(3). EPA 40 CFR 117.21 requires the immediate notification of the appropriate agency of the U.S. Government when a discharge equal to or exceeding the reportable quantity occurs in any 24-hour period.

*c. Permits.*

(1) EPA 40 CFR 122 “EPA Administered Permit Program: The National Pollutant Discharge Elimination System” requires in Section 122.1 “Purpose and Scope” that permits must be obtained for the discharge of a pollutant from any point source into waters of the United States. “Discharge” essentially indicates a channeled discharge. Accordingly, unless there is an intent to channel or discharge the paint debris into waters of the United States, it is questionable whether the NPDES permit is required. Conversely, if the intent is to allow the debris to fall into the water, a permit to allow this probably would not be issued. For example, shipyards cannot allow debris to fall into the water.

(2) If a permit is required, obtaining one requires 90 days. The Government or general contractor is responsible for obtaining the permit.

*d. No allowable release(s).* Independent of any interpretations applied to the regulations, paint debris containing lead or other hazardous materials cannot be discharged into the water or be located in an area where it could be carried into a storm sewer; this statement is based on the requirements of 40 CFR 122.26, “Storm Water Discharges.” The emission and debris must be controlled.

## **11-6. Soil Quality Requirements**

*a. OSWER Directive #9355.4-02.*

(1) The Code of Federal Regulations does not address the contamination of soil resulting from lead paint removal projects. However, state and local laws and regulations may provide controls over soil contamination and should be investigated before initiating a project. Although not associated with lead paint removal at this time, the USEPA Office of Solid Waste and Emergency Response (OSWER) provides guidance on cleanup levels for total lead in soil at Superfund sites, which are locations where hazardous waste is “discovered” and must be cleaned up before the property can be used.

(2) OSWER Directive #9355.4-02 “Interim Guidance on

Establishing Soil Lead Clean-Up Levels at Superfund Sites,” dated September 7, 1989, establishes cleanup at total lead levels of 500 to 1,000 ppm when the current or predicted use of the land is residential. The directive states that further guidance on cleanup levels will be developed after the USEPA conducts additional studies. Some states have established their own soil cleanup standards that are more restrictive (e.g., New Jersey at 100 ppm), and a Canadian province (Ontario) established cleanup guidelines for lead in soil dependent upon land use (i.e., agricultural, 60 ppm; residential/parkland, 500 ppm; commercial/industrial, 1,000 ppm).

*b. Pre- and post-job soil sample analysis.* Despite the lack of guidance on permissible lead soil contamination for paint removal projects, some owners have the lead in soil analyzed prior to project start-up and on completion. Unfortunately, without definitive guidance on the levels of lead from paint removal projects that are harmful, firm specification requirements on allowable increases are difficult to develop. Specifications have been written in private industry to stipulate that no increase in the soil lead level should be observed on project completion; others allow an increase up to a certain percentage. However, specifications that demand a 0 percent increase in soil lead levels do not allow for variability in the methods used for sampling and analysis, and thus can be unattainable. Also, specifications that permit a given increase to occur (e.g., 10 percent) may be unattainable if the original soil contains little to no lead. Allowing an increase of a certain amount (e.g., 100 ppm) of total lead regardless of the initial level may provide a compromise position.

*c. Sampling and analysis.* Site-specific factors must be considered by the project designer in the final site selection criteria. For instance, the number of sampling locations along the structure and the distance away from the structure depend on such factors as the height and length of the structure, wind conditions, obstacles, and the topography of the land.

(1) The project is divided into “unique structures.” For example, each water or fuel storage tank, even if it is a part of a large tank farm, is considered to be a unique structure. For bridge projects, each segment of the bridge between support piers is considered to be a unique structure. For buildings, each building, regardless of its size, is considered to be a unique structure.

(2) If the structure crosses soil (either the ground below or the banks of a river or shoreline), a minimum of two samples are taken at locations spaced equidistant from each end or side and directly beneath the center of each unique structure, if appropriate. The number of sampling locations

beneath the structure usually is increased in proportion to the “floor area” of the structure. For example, one additional sample might be removed for every 465 m<sup>2</sup> (5,000 sq ft) of ground surface covered.

(3) An additional series of samples should be considered around the structure on each side (north, south, east, and west) in which soil is present:

(a) If the structure is less than 15.25 m (50 ft) in height, the samples should be removed at a distance away from the structure roughly equivalent to its height. For long structures, one sample location should be selected for every 30.5 m (100 lineal feet).

(b) For structures more than 15.25 m (50 ft) in height, two rows of sample locations should be selected along each side. The first row should be located within 15.25 m (50 ft) of the structure and the second at a distance approximately one times the height of the structure. One sample in each row should be selected for every 30.5 m (100 lineal feet) of structure.

(4) If high-risk receptors (e.g., schools, day-care centers, occupied housing, hospitals) are located close to the work area, soil samples should be removed at each high-risk receptor location.

(5) Additional surface and subsurface soil sampling, soil hydrology studies, and other aspects of an environmental site characterization study may be necessary to properly assess the need (and magnitude) for remediation if soil contamination is identified during postproject soil sampling.

*d. Sampling and analysis procedures.*

(1) Measure and record the specific location of each of the sites. The documentation must be sufficiently accurate to allow a technician to return to the precise location when the project is completed.

(2) At each site, center and align a 0.093 m<sup>2</sup> (1 sq ft) template parallel or tangential to the structure.

(3) Remove a sample of soil 19 mm (3/4 in.) in diameter and 12.7 mm (1/2 in.) deep at the center of the template and at each of the four corners. Place each of the five plugs in a single bag. This represents the sample at the specific location.

(4) Seal each bag and record the date of testing, specific location, name of technician removing the sample, names of others present, and signatures.

(5) Enter the sample information into a log book, and record the laboratory to which the samples are sent for testing and the date of shipment.

(6) The samples must be analyzed in accordance with USEPA method 3050, Acid Digestion of Sediments, Sludge, and Soils, or a USEPA-approved equivalent method.

(7) When the results are received from the laboratory, enter them into the log book.

(8) When the project is completed, return to the precise locations and repeat the sampling process.

*e. Remediation.* The contractor should be required to return the soil to background levels if an unacceptable increase (e.g., 100 ppm) is discovered.

## **11-7. Handling, Storage, and Disposal of Hazardous Waste**

*a. Regulations.*

(1) RCRA.

(a) The Resource Conservation and Recovery Act (RCRA) was issued in 1976; its regulations are found in 40 CFR 240 through 280. RCRA added provisions to the previous Solid Waste Act pertaining to hazardous waste management by establishing the following goals: to protect human health and the environment, to reduce waste and conserve energy and natural resources, and to reduce or eliminate the generation of hazardous waste as expeditiously as possible.

(b) RCRA is divided into 10 subtitles labeled A through J. Regulations regarding hazardous waste are in Subtitle C “Hazardous Waste Management.” Hazardous waste is regulated under RCRA if more than 100 kg (220 lb) are generated each month; this should encompass most lead paint removal projects. If less than 100 kg (220 lb) of waste are generated, the detailed RCRA documentation requirements do not apply, but the generator must assure proper disposal. However, disposal sites may require an identification number before accepting the waste.

(c) The purpose of Subtitle C is to establish a system for controlling hazardous waste from its generation (“cradle”) to its ultimate disposal (“grave”). Thus, the coined phrase “cradle-to-grave.”

(d) The RCRA Subtitle C rules identify three regulated activities: generators of hazardous waste, transporters of



hazardous waste, and owners or operators of hazardous waste treatment, storage, or disposal facilities.

(e) The USACE is the generator of the waste and therefore is responsible for its proper handling and disposal, even if a contractor is hired to test, handle, store, and arrange for the waste transportation and disposal.

(2) RCRA land disposal restriction treatments and standards. Since enactment of the Land Disposal Restrictions in August 1990, hazardous lead paint debris may no longer be land disposed unless it is further treated to render it nonhazardous. Treatment typically involves mixing the debris with cement-like material at the disposal facility. However, additives can be combined with the abrasive prior to use that may render the debris nonhazardous at the point of generation. Research is being conducted to determine whether these additives provide long-term stabilization.

(3) CERCLA.

(a) Although the management of hazardous waste from cradle-to-grave is addressed by RCRA, RCRA does not address the cleanup of existing sites containing hazardous waste, nor does it address releases or spills of hazardous substances. These problems are addressed by CERCLA, commonly called Superfund. CERCLA was enacted in 1980 both to remedy current releases of hazardous substances and to address the cleanup of sites in which hazardous waste is found. CERCLA originally was authorized for 5 years, but in 1986 it was amended by the Superfund Amendments and Re-Authorization Act (SARA). SARA extended the time frame of CERCLA and increased the funding from \$1.6 billion to \$8.5 billion. SARA also included provisions for public education, emergency planning, and the notification of state and local authorities if releases of certain chemicals occur. This is found in SARA Title III, the Emergency Planning and Community Right-To-Know Act, which was enacted in reaction to the toxic chemical release in Bhopal, India.

(b) The CERCLA and SARA requirements are addressed in 40 CFR Subchapter J, "Superfund, Emergency Planning and Community Right-To-Know Programs," covering Parts 300 through 373.

(c) A CERCLA release must be reported if lead paint, dust, and debris escape the work area into the environment (i.e., ambient air, water, soil) in the quantities identified under 40 CFR 302, "Designation, Reportable Quantities, and Notification." Lead is listed in 40 CFR 302 with a reportable quantity of 10 lb (4.5 kg) in a 24-hour period. The total square feet of paint that might generate a CERCLA response if removed by blast cleaning without

containment will vary depending on the initial lead content and thickness of the paint, but it could be less than 100 sq ft (0.09 sq m).

*b. Definition and testing of hazardous waste.*

(1) Hazardous waste characteristics. A hazardous waste is garbage, sludge, solid, or semisolid that is discarded and determined to be a threat to health or the environment by exhibiting any of the following characteristics: ignitability (assigned the USEPA hazardous waste number of D001), corrosivity (assigned the USEPA hazardous waste number of D002), reactivity (assigned the USEPA hazardous waste number of D003), toxicity (assigned a variety of unique USEPA numbers beginning with D004; lead is D008).

(2) Unused coating (ignitability). Unused paint may be considered hazardous because of ignitability and, depending on its constituents, toxicity.

(3) Heavy metals concentration (levels).

(a) Debris generated during paint removal is classified as hazardous because of toxicity if the amount of toxic material leached or extracted from the debris using the toxicity characteristic leaching procedure (TCLP) exceeds a certain threshold.

(b) The leachable levels that classify debris as hazardous because of toxicity are listed in Table 11-2. The results in Table 11-2 can also be given in parts per million (e.g., 5 mg/L = 5 ppm). The metals typically of concern in paint are lead, chromium, barium, cadmium, and mercury.

| <b>Metal</b> | <b>Concentration, mg/L</b> |
|--------------|----------------------------|
| Arsenic      | 5.0                        |
| Barium       | 100.0                      |
| Cadmium      | 1.0                        |
| Chromium     | 5.0                        |
| Lead         | 5.0                        |
| Mercury      | 0.2                        |
| Selenium     | 1.0                        |
| Silver       | 5.0                        |

(4) Toxicity characteristic leachable procedure.

(a) Sample collection. Collection of the samples for

testing typically requires the use of simple random sampling, with a minimum of four samples required from each waste stream. Sampling should represent the entire waste stream from single job (for small projects), or a sample may be removed daily, weekly, or at some other frequency. The use of a statistician in developing sampling plans can be helpful.

(b) Test procedure. The TCLP is outlined in Appendix II of EPA 40 CFR 261. A minimum sample size of 100 grams (g) is required for each test. An acid solution is prepared as the extraction fluid; this fluid is combined with the waste using specialized procedures and placed in an extraction vessel that tumbles end-over-end for 18 hours. The liquid is analyzed at the end of the extraction for heavy metals using atomic absorption spectroscopy or inductively coupled plasma-atomic emission spectroscopy.

*c. Generator requirements.*

(1) For paint removal, the generator of the waste is typically the owner of the facility. If the volume of the debris is greater than 100 kg (220 lb) per month, the generator must comply with all of the regulations for generators found in EPA 40 CFR 262 and the many parts referenced. A conditionally exempt small quantity generator (less than 220 lb) need not comply with the detailed EPA 40 CFR 262 regulations but must ensure that the waste is properly disposed of or recycled.

(2) A summary of the requirements for the small- and large-quantity generators according to RCRA follows. A large-quantity generator generates over 1,000 kg (2,200 lb) of hazardous waste per month, or stores more than 6,000 kg (13,200 lb) of waste at the site at any one time. A small-quantity generator generates more than 100 kg (220 lb) but less than 1,000 kg (2,200 lb), of hazardous waste per month, and accumulates less than 6,000 kg (13,200 lb) at any one time.

(a) Identification of waste. EPA 40 CFR 262.11 requires that the generator determine if the waste is hazardous. This is accomplished by applying knowledge of the hazardous characteristics of the material in light of the process used, or through laboratory testing. The laboratory testing is intended to simulate the type of long-term leaching that could occur in sanitary landfills. If the leaching lead paint debris exceeds the allowable levels given here the debris is considered to be hazardous because of toxicity.

(b) USEPA identification number (40 CFR 262.12). The generator must obtain an identification number to treat, store, dispose of, transport, or offer for transportation, the hazardous waste.

(c) Notification and certification (40 CFR 268.7 and 40 CFR 268.9). A notification and certification must be provided by the generator and treatment facility for each shipment of debris. The specific wording is found in the regulations and varies according to whether the restricted waste tests hazardous or tests nonhazardous, or has been treated to render it nonhazardous. Information required can range from an identification of the treatment standards that should be used for the debris, to certifications about the personal knowledge of the waste, treatment process, and test results. False certification can result in a fine and/or imprisonment.

(d) Manifesting the waste (40 CFR 262.20 through 262.23). The generator must complete a hazardous waste manifest that accompanies each shipment. The manifest includes a description of the waste, the name of the facility permitted to handle the waste, and an alternate facility. The generator signs the manifest as does each transporter and the final disposal facility. The completed manifest must be returned to the generator within a designated number of days (45 days for large-quantity generator and 60 days for small-quantity generator). If the manifest is not received, the manifest and debris must be tracked and located. The manifest assures that the waste is properly handled from the collection of the debris to its final disposal.

(e) Packaging and labeling requirements (40 CFR 262.30 through 262.33). The waste must be packaged in accordance with the requirements of the 40 CFR 262 sections given here and Department of Transportation Regulations presented in 49 CFR 173, 178, and 179, with labeling accomplished in accordance with 49 CFR 172. Essentially, 49 CFR 172, 173, 178, and 179 require that the packaging be capable of preventing leakage of the waste during normal transportation conditions and upset conditions (e.g., container falling out of a truck), and require the use of labels, marking, or placards to identify the characteristics or dangers associated with transporting the waste. The labels must identify the contents, tare weights of the containers, origin of the material, and the date.

(f) Container enclosure requirements (40 CFR 265). The requirements vary between the large- and small-quantity generator, but both essentially require the use of leakproof drums or bins with secure lids or covers for containing the material, with the storage site locked and located on well drained ground. The containers must be inspected for corrosion and leaking.

(g) Contingency plan and training (40 CFR 265 and 40 CFR 262.34). Personnel involved with the handling of hazardous waste must be trained to respond effectively to emergencies; this also includes paint removal crews. Basic

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safety information must be available, including hazardous labels on containers, the date the accumulation first begins, the name and telephone number of a site employee who is the emergency coordinator, the telephone number of the fire department, the location of the fire extinguisher, and other similar contingency items.

(h) Waste analysis plans for onsite treatment (40 CFR 268.7). If the generator decides to treat the waste onsite to render it nonhazardous, a written waste analysis plan must be filed with the USEPA regional administrator a minimum of 30 days prior to the treatment activity.

(i) Waste accumulation time (40 CFR 262.34). There are restrictions on the length of time that the waste may accumulate onsite. A large-quantity generator may

accumulate the hazardous waste onsite for 90 days or less without a permit, with an extension of up to 30 days possible because of unforeseen, temporary, or uncontrollable circumstances. A small-quantity generator may accumulate waste onsite for 180 days, with a possible exemption permitting up to 270 days. If these time limits are exceeded, the generator may be considered to be an operator of a storage facility and would be subject to other extensive requirements.

(j) Recordkeeping and reporting (40 CFR 262.40 through 262.44). The signed manifests and associated documentation must be maintained for at least 3 years. For generators who treat the waste onsite, the recordkeeping requirements can be more elaborate.