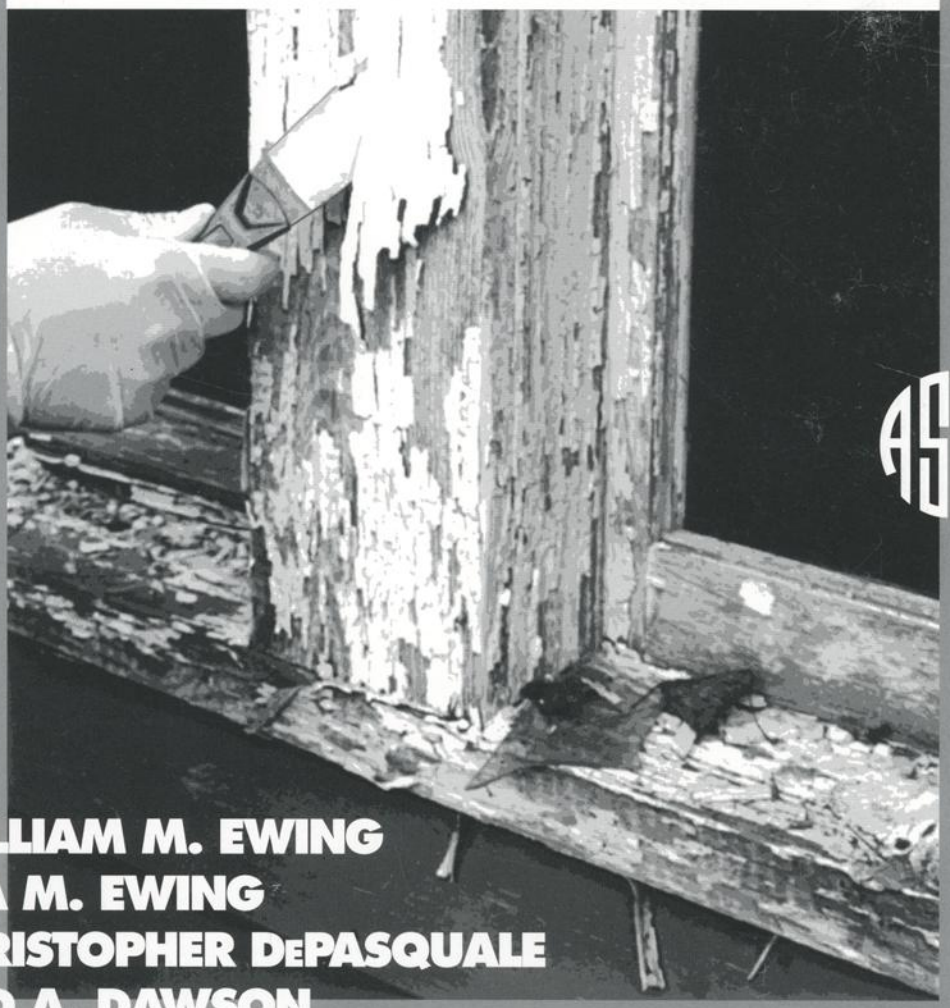
LEAD HAZARD

EVALUATION AND CONTROL IN BUILDINGS



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Lead Hazard Evaluation and Control in Buildings

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NOTE: This manual does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this manual to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

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Preface

THE SUBJECT OF lead hazard control and mitigation continues to receive significant attention. The focus of the attention is the potential hazard that lead poses to the developmental capabilities and health of young children and the health of construction workers. Federal and local regulations have been promulgated in response to legislation to reduce the human-health hazards from lead. Standards play an important role in lead-hazard regulations, programs, and activities.

ASTM Subcommittee E06.23 was formed in response to a request from the United States Department of Housing and Urban Development (HUD) in 1991 to provide to the public a comprehensive set of consensus standards that describe procedures for assessing, abating or mitigating, and monitoring lead hazards in buildings. Liaisons were formed with other ASTM committees, including D01 on paints and related materials, D18 on soil and rock, D22 on sampling and analysis of atmospheres, and E50 and E51 on environmental assessments. E06.23 has also coordinated its efforts with HUD, the Centers for Disease Control (CDC), the U.S. Environmental Protection Agency (EPA), the National Institute for Occupational Safety and Health (NIOSH), the National Institute for Standards and Technology (NIST), the Consumer Product Safety Commission (CPSC), the Department of Defense (DOD), the Occupational Safety and Health Administration (OSHA), and other federal state agencies to assist the subcommittee in meeting this goal.

The Subcommittee developed the "Standard Guide for Evaluation, Management, and Control of Lead Hazards in Facilities" (designated ASTM Standard E 2052). This standard provides guidance to facility owners and property managers in developing and implementing a lead hazard management program. This handbook was developed to provide further guidance in establishing a successful program.

Mary E. McKnight
Chairperson, ASTM E06.23

Disclaimer

USERS OF THIS MANUAL are advised that federal, state, and local regulations affecting lead hazards in facilities change frequently. It is the user's responsibility to comply with all applicable regulations and remain informed of changes to standard methods and practices.

This manual does not purport to address all of the environmental, safety, and health concerns, if any, associated with its use. It is the responsibility of the user of this manual to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this manual. Users of this manual are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

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The authors are indebted to the Editorial Board established for this project, and the external peer reviewers. Each of these individuals are experts in the field of lead hazard control in their own right. Together, they provided an unsurpassed base of knowledge which the authors could draw upon. Of particular note are Mr. Geoff Braybrooke and Dr. Warren Friedman, who volunteered many weeks of effort on the original ASTM standard and this interpretive guidance manual.

The authors express their sincere appreciation to Ms. Kathy Dernoga and her staff at ASTM headquarters. Their guidance and expertise in shepherding this project through to completion was a significant accomplishment.

Lastly, this project would not have been possible without the hard work of the ASTM Subcommittee E06.23 volunteers. Under the leadership of Dr. Mary McKnight this subcommittee has produced 22 full consensus standards addressing lead hazard identification, evaluation, and control.

EDITORIAL BOARD

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Abbreviations

kg	kilograms
mg/cm^2	milligrams per square centimeter
µg/dl	micrograms per deciliter
µg/ft^2	micrograms per square foot
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
ABIH	American Board of Industrial Hygiene
AIHA	American Industrial Hygiene Association
ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
BCSP	Board of Certified Safety Professionals
CDC	Center for Disease Control and Prevention
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CoE	The Corps of Engineers
CPSC	Consumer Product Safety Commission
CSP	Certified Safety Professional
DOT	Department of Transportation
EBL	Elevated blood lead level
EIBLL	Environmental intervention blood lead level
EPA	Environmental Protection Agency
FAAS	Flame atomic absorption spectrometry
GFAAS	Graphite furnace atomic absorption spectrometry
GFI	Ground fault interrupter
HEPA	High efficiency particulate air
HUD	Department of Housing and Urban Development
ICP-AES	Inductively coupled plasma / Atomic emission spectrometry
IQ	Intelligence quotient
ISO	International Standards Organization
LBP	Lead-based paint
LOD	Limit of detection
LHMP	Lead hazard management program
NIBS	National Institute of Building Sciences
NIOSH	National Institute for Occupational Safety and Health
NLLAP	National Lead Laboratory Accreditation Program
O&M	Operations & maintenance
OSHA	Occupational Safety and Health Administration
PEL	Permissible exposure limit
Pb	Chemical symbol for lead
RCRA	Resource Conservation and Recovery Act
SOP	Standard operating procedure
SSPC	Steel Structures Painting Council
TBA	Tenant-based assistance
TC	Toxicity characteristic
TCLP	Toxicity characteristic leaching procedure
TSCA	Toxic Substances Control Act
USDA	United States Department of Agriculture
XRF	X-ray fluorescence

CHAPTER 1: INTRODUCTION AND SUMMARY

This chapter provides an introduction to the lead hazard identification and management handbook, and describes the roles of various persons who might use the document.

1.1 Intended Users of This Handbook

The intended users of this handbook are the lead hazard management decision makers. The handbook will assist in the development of a Lead Hazard Management Program (LHMP) in accordance with ASTM E 2052.

1.1.1 The lead hazard control manager

The Lead Hazard Control Manager is the person who is responsible for dealing with lead hazards within a facility. The Lead Hazard Management Program will enable the Lead Hazard Control Manager to address lead hazards and make informed decisions within a facility by ranking probable hazards based on their severity.

1.1.2 Facility owners and managers

Facility Owners and Managers may use this handbook to develop a program to protect occupants or visitors to their facilities from probable lead hazards. The program should also protect staff and other workers from existing lead hazards. The handbook will assist the owner or property manager in using ASTM and other standards in accomplishing this goal.

1.1.3 Lead hazard control consultants and contractors

This handbook is a useful tool for lead hazard control consultants and contractors. It is designed to give them a better understanding of the processes used to develop a program. Contractors and consultants should understand the rationale in prioritizing and making decisions with regard to lead hazard control methods. The handbook should also permit consultants to better understand ASTM E 2052 and improve service to their clients.

1.2 Determining the Need for a Lead Hazard Management Program

1.2.1 Scope of ASTM E 2052

ASTM E 2052 provides guidance for developing and implementing a lead hazard management program. It is intended for use in facilities likely to be occupied or visited by children under six years of age or by women of child bearing age. The purpose of the standard is to protect occupants, visitors, staff, other workers, and the environment from lead hazards in these facilities. ASTM E 2052 is designed for use by property managers and owners to provide an organized approach to using ASTM and other existing standards in accomplishing this goal.

ASTM E 2052 goes beyond existing regulations in several respects. Most importantly, the standard attempts to address all lead hazards, rather than those posed only by lead-based paint. The standard further recognizes that paint with even small amounts of lead (leaded paint) can present a lead hazard under certain circumstances.

1.2.2 Which buildings in a facility need a LHMP?

If a facility is likely to be occupied or visited by children under six, or by pregnant women, a program is appropriate. As guidance, a facility should be included if visited by a child or children under six for at least several hours per week. The nature and scope of the program depends on other factors, such as building age, occupancy status, and usage. Childhood lead poisoning has been labeled by the Centers for Disease Control and Prevention (CDC) as "the number one environmental health hazard facing American children." Lead poisoning in children can result in reductions in IQ and attention span, reading and learning disabilities, hyperactivity, and behavioral problems. These negative effects can also be found among children whose mothers were exposed to lead during their pregnancies.

The standard and this handbook may be adapted by some facility managers or owners for use in buildings not strictly covered by the standard. Examples of this application include college dormitories and junior high school buildings.

1.2.3 Summary of the LHMP elements

ASTM E 2052 outlines a procedure for identifying and managing lead hazards in facilities. Facilities requiring a program are classified according to their lead hazard potential. For those facilities in which leaded paint or lead hazards are probable, the findings should be documented and the facilities ranked based on their need for action. Facilities that are not likely to have leaded paint or lead hazards should also have documentation supporting this finding.

Facilities in which leaded paint or lead hazards are probable will be included within the program. The program will address such activities as:

- Routine maintenance and cleaning.
- Occupant education and training.
- Environment, safety and health.
- Real estate transaction procedures.
- Elevated blood lead level child response.
- Criteria used to prioritize actions if more than one facility is being managed under the program.
- Planning lead hazard control projects.
- Conducting lead hazard control projects.
- Selection of Testing Methods.
- On-going monitoring of facilities.
- Records management.
- Program audits and revisions.

The LHMP is the framework the program manager uses to reduce and eliminate lead hazards in a facility. It provides the path from hazard evaluation, through management, and control of the hazards in an orderly and effective manner.

1.2.4 Advantages and limitations of a LHMP

The program will assist in providing a healthy environment for building occupants, visitors, and workers. The program will assist in developing an organized approach to using ASTM and other standards. In addition, utilizing a program will demonstrate a proactive approach to environmental health issues by facility managers and owners and provide an in-place program to anticipate the potential disturbance of lead hazards.

Figure 1.1: This married student housing facility is a good candidate for a Lead Hazard Management Program

There are some limitations associated with the LHMP. The program does not apply to occupational exposures other than those resulting from maintenance, cleaning, lead hazard control work, and other work that may generate lead hazards within the facility. Individuals whose occupation outside their place of residence may result in lead exposures, such as a brass foundry worker, would not be part of the program. ASTM E 2052 was not intended for this application. The OSHA lead standard for general industry (29 CFR 1910.1025) must be followed.

ASTM E 2052, as a guideline for the development of the program, is based on federal and national private-sector standards and guidelines. These may be different from applicable state and local regulations or even other ASTM standards. Users of the standard must comply with all applicable laws and regulations. The guidance provided by the Standard and this handbook may need to be modified accordingly. The user of the Standard or handbook is advised to adopt the most stringent version of each requirement among federal, state and local regulations.

1.2.5 Integration of the LHMP into overall facility management

For the program to be effective, it is important that the program be integrated into the overall facility management. A well-designed program will fail if not properly implemented and enforced. This is usually best accomplished by merging the program with existing management practices so it becomes the norm rather than the exception. Integration of the program into overall facility management, including the budget process, normally results in a more efficient use of available resources.

Well-maintained facilities usually have a maintenance program consisting of the same basic elements of a lead hazard management program. A good maintenance program includes inspections, repairs and records management. A good maintenance program also includes training and education for the staff and occupants. These elements parallel those of a good lead hazard management program.

1.3 How to Use This Handbook

Many or all of the chapters within the handbook may be of interest to the reader, but most chapters are intended to stand alone. Information within each chapter is normally presented to address specific portions of ASTM E 2052. Where

appropriate, this handbook cites the applicable section of E 2052 in the headings. The reader should have a copy of the most recent version of E 2052, available from ASTM.

1.3.1 Application of ASTM E 2052

The chapters of this handbook were developed to address specific areas of ASTM E 2052. They are designed for use as a reference to solve problems when developing a program. The current chapter serves as an introduction to the lead hazard evaluation, management and control handbook. It also describes the roles of the various persons who might use the document. The other chapters within the handbook address the following issues, their titles are followed by a number in parentheses indicating the section of the ASTM E 2052 Standard that chapter corresponds to:

- **Chapter 2: Information and Guidance On Lead Hazards**

  Chapter 2 provides a summary of the lead hazard information and guidance available to lead hazard program managers. This chapter includes reviews of printed materials, on-line assistance, and technical guidance available to the program manager, consultants, and others.

- **Chapter 3: Summary of the Lead Hazard Management Program**

  Chapter 3 provides a concise summary of the program elements.

- **Chapter 4: Basic Management Elements of the Program**

  Chapter 4 contains a discussion of the basic management elements that are common to all parts of the lead hazard management program.

- **Chapter 5: Collecting Information on Facilities (6)**

  Chapter 5 describes the methods needed to collect and assimilate available information about buildings and facilities. This chapter provides a classification scheme based on facility age, design, use and occupancy characteristics to sort buildings based on the likelihood of lead hazards. This information is used by the lead hazard program manager to prioritize hazards and allocate resources more efficiently.

- **Chapter 6: Lead Hazard Evaluation (7)**

  Chapter 6 presents guidance on when and which lead hazard evaluation techniques should be employed for a building or a group of buildings. While a summary of the various lead hazard evaluation methods is provided, emphasis is placed on how to select among the methods and how to prioritize buildings for lead hazard evaluations.

- **Chapter 7: Initiating the Lead Hazard Management Plan (8)**

  Chapter 7 describes how to develop lead hazard management plans for class A and B facilities. The intent or goal of the plans is to ensure that building occupants are provided with facilities free of lead hazards.

- **Chapter 8: Operations and Maintenance (O&M) Program (9)**

  Chapter 8 describes the elements of an O&M program designed to minimize lead exposure in facilities. The O&M program consists of a set of standard procedures for conducting custodial, maintenance, and repair activities without significant increases in lead exposure.

- **Chapter 9: Occupant Education and Training Program (10)**

  Chapter 9 provides instruction and guidance on how to design and manage a program to educate building occupants about potential lead hazards in their facilities. General elements of the program include notification of lead hazards, a description of the program, actions the occupants should take to minimize risks and procedures for relocation if necessary to prevent lead exposure.

- **Chapter 10: Environmental, Safety, and Health Programs (11)**

  Chapter 10 describes the elements of an environmental, safety and health program to minimize lead exposure to personnel and the environment. The program is composed of an occupational health and safety program, an environmental protection program, and a waste management program.

- **Chapter 11: Planning Lead Hazard Control Projects (14)**

  Chapter 11 describes the procedures to plan lead hazard control projects and to prioritize these projects. Lead

hazard control projects are intended to control or eliminate the source(s) of lead hazards.

- **Chapter 12: Performing Lead Hazard Control Projects (15)**

  Chapter 12 describes the procedures to administer lead hazard control projects. The purpose of the projects is to efficiently control lead hazards while simultaneously protecting workers, occupants and the environment.

- **Chapter 13: Ongoing Monitoring and Evaluation (16)**

  Chapter 13 describes appropriate procedures for conducting routine surveillance of facilities having potential sources of lead hazards remaining. These procedures are intended to verify that previously instituted control measures remain effective and new lead hazards are detected in a timely manner.

- **Chapter 14: Real Estate Transactions (12)**

  Chapter 14 addresses applicable regulations and provides guidance regarding lead hazards as they relate to selling or leasing facilities, or units within facilities.

- **Chapter 15: Elevated Blood Lead Level Investigations (13)**

  Chapter 15 describes elements of an elevated blood lead level investigation and the role played by the lead hazard control manager. This chapter does not provide information or guidance on how to conduct blood lead level measurements, because such work is outside the scope of ASTM E 2052.

- **Chapter 16: Records Management (19)**

  Chapter 16 provides guidance for establishing and maintaining a record keeping system in accordance with ASTM E 2052.

- **Chapter 17: Sampling and Analysis Procedures (18)**

  Chapter 17 provides a summary and guidance for conducting lead-sampling analysis for soil, dust, paint and wastes.

1.3.2 Application of other ASTM standards

The handbook will assist the user in utilizing other ASTM Standards whenever necessary to develop the program. During the process of developing a program, other ASTM standards may be of use in performing the tasks involved. For example, paint chip sampling and analysis (ASTM E 1729, E1645, and E1613), in-situ lead analysis by XRF (ASTM E 1775), or dust wipe sampling (ASTM D 1728, E 1792, and E 1644), procedures may be needed in the development of the program. The handbook will assist in utilizing the relevant ASTM Standard whenever possible. It is important to note that Federal, state, or local regulations and guidelines may also be applicable. In most instances, procedures found in ASTM standards will meet or exceed regulatory requirements. ASTM periodically publishes compilations of ASTM standards on lead hazards associated with buildings.

1.3.3 Coordination with regulatory requirements

Wherever possible and appropriate the handbook will refer to applicable federal regulatory requirements. However, the reader is cautioned that federal regulations frequently change. Furthermore, state and local rules are not addressed in this handbook. It is the responsibility of the Lead Hazard Program Manager to determine the applicability of all regulations and become familiar with their requirements.

1.4 Example Facility Owners and Managers

Throughout this handbook examples are used to illustrate the application of the standard to various situations. The examples provided are usually either a large publicly-funded housing complex or a smaller privately-owned apartment complex. For each example, a situation is described, the problem defined, alternatives considered, and the solution implemented. All examples are hypothetical, but consistent with real world problems and decisions encountered by Lead Hazard Program Managers. Names of the persons and residential communities used in these examples are fictitious, and any resemblance to real persons, companies, or communities is purely coincidental.

CHAPTER 2: INFORMATION AND GUIDANCE ON LEAD HAZARDS

2.1 Outline of the Hazard

Lead is a soft malleable element extracted from the ore galena. It is bluish-white-gray in appearance and has a wide variety of uses. It has been used in many products for both the home and the workplace. Some of the more common uses of lead include containers and pipes for liquids, solder, paint, bullets, radiation shielding, lead acid batteries, and antiknock compound used in gasoline.

Lead is poisonous to humans when it enters the body through ingestion or inhalation. Acute poisoning, as a result of a high exposure for a short period of time, can cause coma, convulsions and death. Less perceptible effects such as memory and concentration problems, hypertension, cardiovascular disease, and damage to the male reproductive system can occur with long-term exposure to small amounts of lead (chronic exposure). Chronic lead exposure has been associated with anemia and neurological damage. Also, exposure to lead before or during pregnancy can negatively affect fetal development and cause miscarriages.

Lead exposure is especially harmful to children for three reasons – their rapidly developing nervous system is particularly sensitive to the effects of lead; they absorb a greater portion of lead to which they are exposed than adults do; and they are more likely to incur exposure than adults when their surroundings are contaminated with lead. In children, excessive lead exposure can cause permanent effects on the brain and nervous system resulting in lower intelligence, behavioral problems, learning disabilities, and impaired hearing, vision, and growth.

Various terms have been coined to describe paint that has different amounts of lead. The most common are lead-based paint, lead-containing paint, and leaded paint. These terms and paint containing any detectable amount of lead are discussed briefly below.

Lead-based paint is paint or other surface coating that contains lead equal to or greater than 1.0 mg/cm^2, or 0.5% by weight. This definition was established by the Lead-Based Paint Poisoning Prevention Act and is frequently referenced in HUD, EPA and many state regulations.

Lead-containing paint is paint having a lead content in excess of 0.06% by weight. The Consumer Product Safety Commission (CPSC) banned the use of lead-containing paint for architectural use, toys, and furniture in 1978.

Leaded paint is paint or other coatings containing lead at potentially hazardous concentrations. Leaded paint includes all lead-containing and lead-based paint.

Paint with lead above laboratory detection limits is paint or other coatings in which lead is at or above the published limit of detection (LOD) when analyzed by a recognized laboratory method. The OSHA lead in construction standard applies to paint and other coatings with any detectable amount of lead.

The primary pathway of lead exposure to children in the United States under six years of age is the ingestion of lead-contaminated dust and soil through normal hand-to-mouth activity. Contamination of dust with lead occurs when: leaded paint deteriorates; leaded paint is disturbed in the course of renovation, repair or abatement activity; or lead is tracked indoors from soil in the yard or the workplace. Common sources of soil contamination are exterior leaded paint, industrial emissions, and deposition of lead from past use of leaded gasoline.

Children are also exposed to lead when they ingest leaded paint chips from flaking walls, window and doors or from chewing on leaded paint covered surfaces. Other avenues for lead exposure include ingestion of lead-contaminated food and drinking water.

Just from leaded paint alone, the potential for lead exposure in housing is cause for great concern. Based on a HUD National Survey, EPA estimates that 13 million or 17 percent of pre-1980 privately owned homes have "elevated" lead dust levels. Until the Consumer Product Safety Commission reduced the allowable amount of lead in domestic paint to 0.06% in 1978, most paint contained 200,000 to 300,000 parts per million (ppm) or 20 to 30% lead. The EPA also estimates that approximately 16 million or 21 percent of pre-1980 privately owned homes have soil-lead concentrations exceeding 400 parts per million.

Children from conception until the age of six are at greatest risk from the ill effects of lead exposure. Nationwide studies have demonstrated that minority children living below the poverty line in cities are at greatest risk of having elevated blood lead content. Risk is further increased when renovations are performed without proper precautions to prevent lead exposures.

Government regulations aimed at reducing environmental sources of lead include the phase-out of leaded gasoline by EPA; the 1978 Consumer Product Safety Commission ban on the production and sale of lead-containing paint for residential use; and more stringent EPA standards for lead in drinking water. The domestic canning industry also voluntarily eliminated the use of lead in solder to seal food cans.

The federal lead program was further strengthened with the Residential Lead-Based Paint Hazard Reduction Act of 1992. While many of the regulations promulgated under this Act address lead hazards associated with occupational exposure, paint, and residential dust and soil, ASTM E 2052 has broadened the scope to include lead in water and environmental sources.

A lead hazard, as defined in E 2052, is a "condition that may cause exposure to lead that may result in adverse human health effects such as exceeding limits established by the federal, state, or local agency having jurisdiction. Such conditions include:

- deteriorated leaded paint,
- lead-contaminated bare soil,
- lead-contaminated dust on such surfaces as floors, window sills, and window troughs,
- the release of leaded paint on, for example, friction, impact or accessible surfaces,
- lead related environmental, occupational, and safety hazards, and
- water containing lead at concentrations exceeding EPA guidelines or applicable regulations.

Preventing exposure to lead is targeted toward controlling these sources and pathways.

2.2 The Essential Bookshelf

Some of the various regulations and guidance documents developed by Federal agencies involved in reducing lead exposures are essential resource documents for the Lead Hazard Control Program Administrator. These include:

- The HUD Guidelines, Task Force Report and selected regulations
- EPA Guidance documents and selected regulations
- OSHA regulations and assistance publications
- NIBS guidance manuals
- Relevant ASTM standards and guides.

Some of these publications and regulations are described below to assist in understanding their general content and application.

2.2.1 HUD guidance and regulations

HUD Guidelines for the Evaluation and Control of Lead-Based Paint in Housing – This guidance document, commonly referred to as the HUD Guidelines, is the best single source of information on inspection, risk assessment, interim control, and abatement of lead hazards currently available. It will serve as a frequent reference for the implementation of a Lead Hazard Management Program.

The HUD Guidelines were issued pursuant to Section 1017 of the Residential Lead-Based Paint Hazard Reduction Act of 1992, which is often referred to as Title X ("Title Ten") because it was enacted as Title X of the Housing and Community Development Act of 1992 (Public Law 102-550). The HUD Guidelines are based on the concepts, definitions, and requirements set forth by Congress in Title X.

To reflect the most up-to-date methods for controlling Lead in housing, the HUD Guidelines are periodically updated. Since

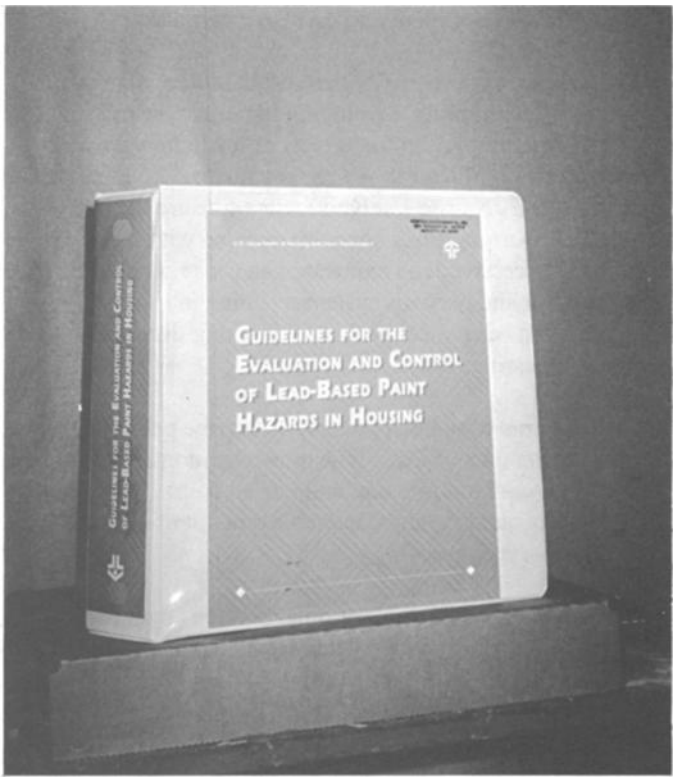


Figure 2.1: The HUD Guidelines must be available to the program manager.

their publication in 1995 there have been several revisions. Chapter 7 and Chapter 5 are among those recently revised.

The HUD Guidelines are comprised of 18 Chapters and 16 Appendixes. The 18 Chapters cover the following topics:

HUD Guidelines Chapter 1
INTRODUCTION

- Legislative basis and relationship to Federal Programs and Regulations
- Background on childhood lead poisoning, sources of lead in the environment, and the evolution of lead poisoning prevention
- The Title X framework
- Organization and use of the Guidelines

HUD Guidelines Chapter 2
WHERE TO GO FOR HELP- QUALIFICATIONS AND ROLES

- Housing
- Health
- Environment
- List of lead periodicals and other publications

HUD Guidelines Chapter 3
BEFORE YOU BEGIN PLANNING TO CONTROL LEAD HAZARDS

- Concept and Purpose
- Determining whether a short term or long term response is appropriate
- Review of existing conditions and preliminary determination of lead hazard control strategy
- Lead hazard evaluation inspection and risk assessment
- Considerations in selecting control methods
- Considerations in cost estimating for abatement
- Specifications
- Pilot projects
- Coordination of lead abatement with other renovation work
- Insurance
- Project Completion

HUD Guidelines Chapter 4
LEAD-BASED PAINT AND HOUSING RENOVATIONS

- Lead-based paint hazards in housing renovation
- Combining renovation and abatement
- Safe older home renovation procedures
- Prohibited Activities
- General guidance for selected renovation activities

HUD Guidelines Chapter 5
RISK ASSESSMENT

- Introduction (Evaluation options and the risk assessment process)
- Onsite data collection procedures
- Risk assessment for different size evaluations
- Laboratory analytical procedures
- Evaluation of findings
- Reports

HUD Guidelines Chapter 6
ONGOING MONITORING

- Purpose
- Standard reevaluation schedules
- Reevaluation protocol
- Compliance verification

HUD Guidelines Chapter 7
LEAD-BASED PAINT INSPECTION

- Introduction (Qualifications of Inspectors and laboratories)
- Summary of XRF radiation safety issues
- Definitions
- Inspections in single-family housing
- Inspections in multifamily housing
- Laboratory testing for lead in paint
- Radiation Hazards
- References (Examples of inspections)

HUD Guidelines Chapter 8
RESIDENT PROTECTION AND WORKSITE PREPARATION

- Resident entry into work area prohibited
- Site assessment and precleaning
- Debris control
- Worksite preparation levels
- Relocation Dwellings
- Negative pressure zones ("Negative air" machines)

HUD Guidelines Chapter 9
WORKER PROTECTION

- Adult occupational exposure to lead
- Background on Federal worker protection standards for lead
- Previous evaluations of worker exposures during residential lead hazard control work
- OSHA requirements for residential lead hazard control work

- Other employer requirements
- Example of an OSHA written compliance plan

HUD Guidelines Chapter 10
HAZARDOUS AND NONHAZARDOUS WASTE

- Overview of Federal requirements determining if a waste is hazardous under RCRA
- Waste management procedures
- RCRA hazardous waste management requirements
- Waste management case history

HUD Guidelines Chapter 11
INTERIM CONTROLS

- Principles of interim control
- Paint film stabilization
- Friction and impact surface treatment
- Dust removal and control
- Soil interim controls

HUD Guidelines Chapter 12
ABATEMENT

- Principles of lead-based paint hazard abatement
- Building component replacement
- Enclosure methods
- Paint removal methods soil and exterior dust abatement

HUD Guidelines Chapter 13
ENCAPSULATION

- Assessment of surfaces and components for suitability
- Encapsulant classification
- Minimum performance requirements for encapsulants
- Factors to consider in selecting and using encapsulant systems
- Specific encapsulant products and surface preparation procedures
- Application and installation of the encapsulation systems
- Periodic monitoring and reevaluation
- Recordkeeping

HUD Guidelines Chapter 14
CLEANING

- Coordination of cleaning activities
- Cleaning methods and procedures
- Order of cleaning procedures during lead hazard control
- Order of final cleaning procedures after lead hazard control
- Cleaning cost considerations
- Alternative methods

HUD Guidelines Chapter 15
CLEARANCE

- Time between completion of clean-up and clearance
- Visual examination procedures
- Clearance dust samples
- Clearance soil sampling
- Clearance paint testing
- Interpretation of clearance testing results
- Recordkeeping and insurance issues of statement of lead-based paint compliance
- Clearance and reevaluation procedures

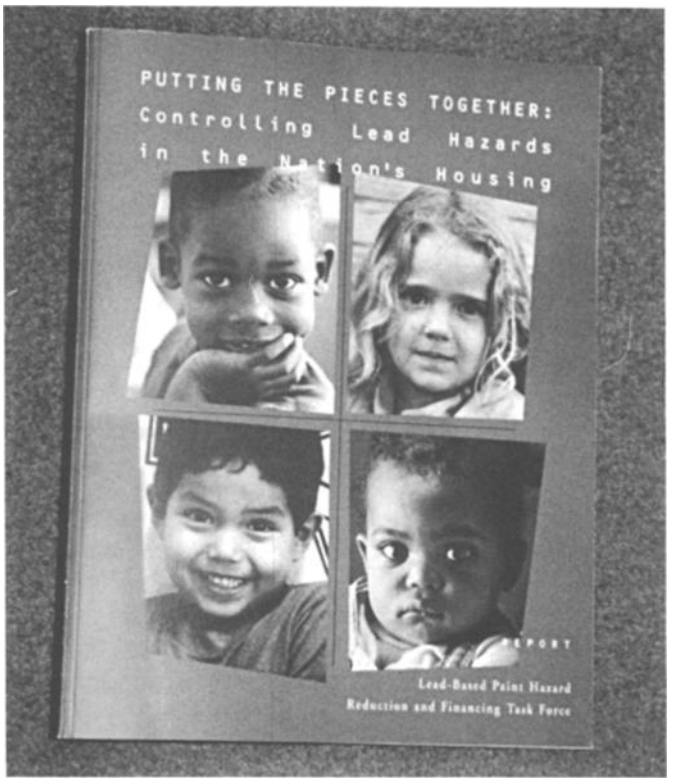


Figure 2.2: The HUD Task Force Report is a useful tool

HUD Guidelines Chapter 16
INVESTIGATION AND TREATMENT OF DWELLINGS HOUSING CHILDREN WITH ELEVATED BLOOD LEAD LEVELS

- Management of lead hazards in the environment of individual children
- Lead hazard identification
- Lead hazard correction

HUD Guidelines Chapter 17
ROUTINE BUILDING MAINTENANCE AND LEAD-BASED PAINT

- The relationship between building maintenance work and lead hazard control work
- Summary of protective measures for low-and high risk maintenance tasks
- Maintenance program elements
- Methods to protect workers and residents during typical maintenance jobs

HUD Guidelines Chapter 18
LEAD HAZARD CONTROL AND HISTORIC PRESERVATION

- Standards for the treatment of historic properties
- Historic preservation issues and lead-based paint
- Property evaluation
- Establishing priorities for intervention
- Selecting from the various methods of paint removal
- Selecting methods other than paint removal
- Conclusions
- Historic preservation project case study

Putting the Pieces Together: Controlling Lead Hazards in the Nations Housing – This report is often referred to as the HUD Task Force Report because Congress directed the Secretary of HUD to create a task force to make recommendations on lead-based paint hazard reduction and financing. The recommendations developed by this task force are intended to augment other initiatives that have been set in motion under Title X of the Housing and community development Act of 1992.

As a blueprint for improving lead hazard control activities, this report provides insight to concepts which have been and will be incorporated into lead related standards and regulations, including ASTM E 2052 (the subject of this document). The report includes 59 recommendations based on 10 principles to guide legislators, policy makers, housing owners and others as they implement lead hazard control activities. These principles are:

- Lead-based paint hazards are costly public health and housing problems.
- The answer to lead poisoning is prevention.
- Units with a likelihood of lead-based paint hazards deserve priority.
- A range of strategies and shared responsibilities is needed.
- All participants in preventing lead poisoning need more information and education.
- Property owners need flexibility in selecting health-protective strategies.
- Market forces must be engaged as mush as possible.
- Public subsidies are vital to controlling hazards in economically distressed units.
- State and local programs should be tailored to meet local needs.
- Prevention programs should build on community-based organizations and should help build their capacity to resolve residential environmental problems.

Of the various recommendations, the one that is the most germane to the development and implementation of a Lead Hazard Management Program is the adoption of benchmark lead-based paint maintenance and hazard controls for pre-1978 rental housing. (Housing for the elderly and zero-bedroom units are exempt unless such housing is occupied by a young child). Many of the recommended controls have been incorporated as standard operating procedures in the ASTM PS-53 standard guidelines for Management of Lead Hazard in Facilities.

A two-tiered approach is recommended to address varying degrees of lead hazards: (1) certain maintenance and other responsibilities apply to all units, and (2) additional hazard control standards apply to higher priority units. According to this scheme, pre-1950 housing units would be classified as high priority units. (See Chapter 5 of this handbook.)

The core maintenance and hazard controls that apply to all pre-1978 rental units that contain lead-based paint include:

- **Essential Maintenance Practices.** These are low-cost maintenance and management activities to help avoid creating lead-based paint hazards and to ensure rapid and safe responses to deteriorating paint. Essential Maintenance Practices are discussed in more detail in Chapter 8 of this handbook.

- **Response to an Elevated Blood Lead (EBL) child.** When a young child occupant is identified as having an elevated blood lead level, the property owner must identify and control any lead-based paint hazards in the unit. Procedures for conducting elevated blood level investigations are provided in Chapter 15 of this handbook.

- **Control Identified Lead-Based Paint Hazards.** The housing owner must address lead-based paint hazards identified by a qualified professional or a local agency official and promptly control hazards in units occupied by young children.

Those facilities which are classified as higher priority units are subject to additional hazard control standards which include

risk assessments or implementation of a standard set of control measures.

- **Risk assessment.** The evaluation is performed by a certified risk assessor to determine if lead-based paint hazards are present. Further owner action is based on the findings of the risk assessment.
  - If no lead-based paint hazards are identified, the owner continues to implement the three standard practices previously described, conducts a follow-up evaluation after an appropriate period of time. Units with two consecutive passes are no longer high priority.
  - If lead-based paint hazards are identified, the owner has the choice between (a) controlling the hazards in all units or (b) for multifamily properties, working with the risk assessor to develop a property-specific Lead Hazard Control Plan that might be more cost effective but equally health protective.
- **Standard Treatments.** If the owner chooses to forgo a risk assessment or inspection, then a standard set of control measures which includes interim and/or permanent control procedures, specialized cleaning, and clearance testing must be implemented.

HUD (24 CFR Part 35) and EPA (40 CFR Part 745) Requirements for Disclosure of Known Lead-Based Paint and/or Lead-Based Paint Hazard in Housing - This regulation was promulgated under section 1018 of Title X. Both EPA and HUD were mandated to issue regulations that would require the disclosure of known lead-based paint hazards in residential housing.

These regulations obligate sellers and lessors of most residential properties built before 1978 to disclose the presence of known lead-based paint, or lead-based paint hazards. If the lead-based paint status is not known, then this must be disclosed. This disclosure must be made at the time of the sale of the property or when the property is being leased. The regulation also requires the seller or the lessor to provide any available records or reports detailing the presence of lead-based paint, or lead-based paint hazards to the buyer or lessee. Sellers and lessors must also provide prospective buyers or lessees with an approved Federal pamphlet. In addition to these requirements, purchasers are provided the opportunity by the regulation to conduct a Risk Assessment or Inspection of the property within a 10 day period before signing a purchase contract. Furthermore, contract documents must include language or acknowledgment of any disclosures pertaining to the property. The burden of compliance for these prerequisites is squarely placed on the agent.

Figure 2.3: New federal regulations are published in the Federal Register

2.2.2 U.S. Environmental Protection Agency (EPA)

EPA regulations emphasize protecting the environment. This broad scope enables EPA to govern and regulate many hazardous materials, including lead that is found both in the home and the workplace. Because lead is a poison, EPA controls the amount of lead dust or fume that can be emitted into the air, the amount of lead dust or matter that can be put into the ground, and the amount of lead that is permitted in our drinking water supply.

Strategy for Reducing Lead Exposures - In 1991, EPA established a strategy to reduce lead exposures to the fullest extent practicable, with particular interest in reducing the risk to children, to avoid high blood lead levels. The EPA strategy includes several major action elements:

- develop methods to identify geographic "hot spots"
- implement a lead pollution prevention program
- strengthen existing environmental standards
- develop and transfer cost-effective abatement technology
- encourage availability of environmentally sound recycling
- develop and implement a public information program
- aggressively enforce environmental standards

Resource Conservation and Recovery Act – Lead containing waste generated during lead hazard control activities is subject to the requirements of RCRA, the basic Federal law governing waste disposal. RCRA regulates hazardous and non-hazardous solid wastes which include liquids, solids, and some gaseous waste. Under RCRA, a waste may be hazardous either because of its characteristics or because it is specifically listed as hazardous.

The "generator" of the waste is required to take the necessary steps to determine if a waste is hazardous and subject to specific disposal requirements. A "generator" is defined as any person at a particular site or location whose act or process produces hazardous waste. This includes property owners and contractors involved in lead hazard control operations or lead abatement projects. Although a building owner may retain a contractor and/or waste hauler to dispose of lead waste materials, the owner is ultimately responsible for proper disposal.

Listed hazardous wastes are unlikely to be generated as a result of lead-based paint control or abatement activities. To determine if waste materials are classified as characteristic hazardous waste, four properties must be evaluated – toxicity, corrosivity, ignitability, and reactivity. Toxicity and corrosivity are the most concern when conducting lead hazard control activities. Chemicals used for paint stripping may be corrosive. Corrosive waste has a pH that is either highly acidic ($pH \leq 2$) or highly basic ($pH \geq 12.5$), or which can corrode steel at a defined rate.

Waste toxicity is measured using the Toxicity Characteristic Leaching Procedure (TCLP) which simulates how the lead would leach from the waste when deposited in a landfill. If the amount of lead extracted from the material using the TCLP method is above the regulatory threshold for lead of 5 mg/L (milligrams/liter), the material is a hazardous waste.

Other requirements of this regulation vary depending on the amount of waste that is generated. Waste generators may be required to obtain an EPA Waste Identification Number. Transporters must obtain an EPA transporter identification number and a hazardous waste manifest must accompany the waste from the site of generation to the site of disposal. Waste containers must be in compliance with Department of Transportation regulations for packing, labeling, marking, and placarding. (49 CFR Part 171-173). More detailed information on waste disposal requirements and documentation is provided in Chapter 12 of this handbook.

Requirements for Lead-Based Paint Activities in Target Housing and Child Occupied Facilities (40 CFR Part 745) - In compliance with the mandates of section 402 of the Toxic Substance Control Act (TSCA), the EPA has promulgated regulations to ensure that individuals involved in the clean-up, abatement, inspection, risk assessment, and project design of lead materials found in "Target Housing or Child Occupied Facilities" are properly trained and certified.

Depending upon the state, the training will either be provided under state regulation or EPA regulation. States were given an opportunity by EPA to introduce their own state requirements for lead abatement activities during the period August 29, 1996 - August 31, 1998. Those states that did not take advantage of this provision became EPA administered states. Individuals in these states can apply to EPA for certification after March 1, 1999. All individuals or firms engaged in lead activities in "Target Housing and Child Occupied Facilities" must be certified by August 30, 1999. After this date EPA will enforce the rule and those in non-compliance will face possible citations.

The work practice standards prescribe the locations that must be tested for lead-based paint, how the samples must be analyzed, and the requirements for an inspection report. The components of a risk assessment are outlined including the visual inspection, testing requirements for the presence of lead and lead dust, locations for soil samples, and the contents of the risk assessment report.

Work practice standards for abatement projects include notification requirements, development of an occupant protection plan, restricted work practices, procedures for soil removal, post-abatement clearance procedures, and the requirements for an abatement report.

2.2.3 Occupational Safety and Health Administration (OSHA)

OSHA has two specific standards that contain protection requirements for workers exposed to lead. The construction industry standard (29 CFR 1926.62) applies to workers involved in construction, alteration, and or repair activities, including painting and decorating. The general industry standard (29 CFR 1910.1025) applies to custodial operations, such as vacuuming and cleaning, that are done in work not related to construction activities (as described in the construction industry standard). The general industry standard also applies to work place lead exposures, such as those that might be found in a lead-acid battery plant.

The protection requirements are triggered when OSHA limits for the amount of lead in the air or in the blood of exposed workers have been exceeded. When exposures exceed the action level of 30 micrograms per cubic meter ($\mu g/m^3$), for more than one day per year, the employer must provide medical surveillance; and for more than 30 days exposure a year, ongoing medical surveillance must be implemented. The permissible exposure limit of 50 $\mu g/m^3$ is the highest level of

lead in the air to which employees can be exposed over an 8-hour day.

The requirements of the OSHA standards fall into the following general categories:

- Exposure Limits
- Exposure Assessment
- Engineering and Work Practice controls
- A Written Compliance Program
- Mechanical Ventilation
- Administrative Controls
- Respiratory Protection
- Protective clothing and Equipment
- Housekeeping
- Hygiene Facilities
- Medical Surveillance and Medical Removal Protection
- Employee Information and Training
- Signs
- Recordkeeping

OSHA has stated that even lead-based paint containing less than 0.06% lead, which is the level established by the Consumer Product Safety Commission (CPSC) as an acceptable level of lead in domestic (house) paint, can cause an exposure to lead at or above their established action level of 30 $\mu g/m^3$. Therefore OSHA regulations may apply to a project that disturbs coatings that do not meet the CPSC definition of a lead-containing paint.

2.2.4 National Institute of Building Sciences (NIBS)

Lead-Based Paint Operations and Maintenance Work Practices Manual for Homes and Buildings

This guidance document provides the reader with practices and procedures for the safe management of leaded paint during routine operations and maintenance activities. The manual is divided into six chapters.

Chapter 1: Introduction

Purpose of the Manual

Chapter 1 outlines the purpose of the manual, which is to help the user control lead dust hazards caused during routine operations and maintenance activities, the tracking of lead dust and debris to other parts outside the hazard control area, methods used to establish effective clean-up of the area, and work practices and controls that provide for worker safety and health.

Assessment of the Hazard

The assessment of lead hazards is also covered in chapter 1 and explains the health effects of lead exposure and the dates and years that lead-based paint was used in homes.

A review of the building history is highly recommended before making any attempts to perform lead work. Chapter 1 provides a list of documents where information on lead-based paint awareness or use may be referenced.

Decisions Regarding O&M Work

It is assumed that users of the manual are experienced with normal building activities and trades. It also addresses the requirement for training of workers and firms engaged in lead hazard abatement. Most equipment and supplies are available from retail hardware and home improvement stores. The only item that may be costly and more difficult to find is a High Efficiency Particulate Air (HEPA) filter. These filters must be used on vacuums and other air filtering devices.

The need for personal protection is addressed and it must be worn during all phases of the work. The work is performed in a regulated area and activities such as eating, drinking and smoking are prohibited. Personal hygiene activities (washing hands & face) must be performed each time the work area is left.

Work Practice Levels

The manual defines three levels of work.

Level 1
: A negligible amount of lead-contaminated dust may be generated, requiring a minimal amount of preparation and worker protection.

Level 2
: A moderate amount of lead-contaminated dust and debris will be generated or disturbed, but neither the quantities nor the duration of effort warrant full-scale work area preparation and worker protection.

Level 3
: Lead-contaminated dust and debris will be generated or disturbed in sufficient quantities and for enough time to warrant full-scale work area preparation and worker protection.

"Icons" identify each level of work. These icons are used throughout the NIBS manual to define the level of work area set-up.

The chapter further describes the "general procedures" which are performed together with the 16 work practices established in chapter 6 of the manual. The general procedures are "preparation" "clean-up" and "work practices"

Chapter 2: O&M Program-Single Family Residences and Small Apartment Buildings (Up to 4 Units)

This chapter provides advice to the building owner for determining the location and extent of lead-based paint. This is done through lead-paint hazard awareness and the recommendation for lead testing in the home. The chapter outlines the various test methods for determining lead in painted surfacing materials. In addition it presents the reader with step by step procedures for the collection of such samples, including clearance sampling.

Different housekeeping procedures are discussed and methods for cleaning various building components including carpets and rugs are provided. The types of waste materials generated by O&M work are briefly outlined and some direction on waste management is provided.

Chapter 3: O&M Programs - Multi-Family Residential, Public and Commercial Regulations

For O&M work in multi-family residential work it is suggested that the O&M procedures be written and adopted as a working program. There is further discussion on paint sample collection and analysis as it applies to the larger facility. The chapter then provides advice on the selection of professional help that may be needed during the project. An O&M program outline is provided which includes notification of residents, selection of work practices, scheduling, training, housekeeping procedures and waste disposal.

Chapter 4 Regulations and Guidelines Governing Lead-Based Paint

This chapter deals in some detail with OSHA's standard for lead in the construction industry (29 CFR 1926.62), the hazard communication Standard (29 CFR 1926.59), and other general industry health and safety Standards. A brief review of EPA Resource Conservation and Recovery Act (RCRA) and the HUD Guidelines again provide some information on waste disposal and clearance criteria.

Chapter 5 General Procedures

Chapter five covers the general procedures and establishes levels for lead work. Methods for containment and set-up of lead work sites are described. The clean-up of each level is discussed and the tools and equipment needed to perform the work are described.

Chapter 6: Work Practices

Sixteen work practice levels are addressed:

1. Removing Paint Chips and Debris
2. Cleaning Damaged or Deteriorated Surfaces
3. Removing Small Areas of Paint
4. Wet Sanding
5. Penetrating Lead-Based Paint
6. Removing Components from Lead-Painted Surfaces
7. Attaching to a Lead-Painted Surface
8. Applying Coatings to Lead-Painted Surfaces
9. Installing Materials Over Lead-Painted Surfaces
10. Enclosing a Lead-Painted Surface
11. Patching a Lead-Painted Surface
12. Exposing Lead-Paint Contaminated Cavities
13. Door and Window Maintenance
14. Changing Filters and Waste Bags in HEPA Vacuums
15. Cleaning or Removing Contaminated Carpets
16. Landscaping in Soil Containing Elevated Levels of Lead

The National Institute of Building Sciences (NIBS) Guide Specifications for Reducing Lead-Based Paint Hazards (May 1995) – These guide specifications provide the user with a standard set of contract specifications for lead-based paint hazard control and abatement projects. These specifications are designed for the project designer to tailor the specifications to the specific facility and project(s). Guidance is provided on how to prepare and assemble the contract documents and select the contractor. The guide specifications are available in notebook format and a diskette version for a fee from the National Institute of Building Sciences, 1201 L Street, NW, Suite 400, Washington, DC 20005-4024.

2.2.5 ASTM standards and guides

ASTM has published a number of standards dealing with lead issues. The following list is not inclusive of all ASTM standards dealing with lead, but sets forth those most likely to be helpful in implementing the Lead Hazard Management Program. The following list includes the title of the standard and its scope:

E 1553
Standard Practice for Collection of Airborne Particulate Lead During Abatement and Construction Activities

This practice covers the collection of airborne particulate lead during abatement and construction activities. The practice is intended for use in protecting workers from exposures to high concentrations of airborne particulate lead. This practice is not intended for the measurement of ambient lead concentrations in air.

E 1583
Standard Practice for Evaluating Laboratories Engaged in the Determination of Lead in Paint, Dust, Airborne Particulates, and Soil Taken From and Around Buildings and Related Structures

This practice covers the qualifications, including minimum requirements for personnel and equipment, duties, responsibilities, and services of laboratories engaged in the determination of lead in paint, dust, airborne particulates, and soil taken from and around buildings and related structures.

E 1605
Standard Terminology Relating to Abatement of Hazards from Lead-Based Paint in Buildings and Related Structures

This terminology covers terms and conditions pertaining to the field of abatement of hazards from lead in and around buildings and related structures.

E 1727
Standard Practice for Field Collection of Soil Samples for Lead Determination by Atomic Spectrometry Techniques

This practice covers the collection of soil samples using coring and scooping methods. Soil samples are collected in a manner that will permit subsequent digestion and determination of lead using laboratory analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Absorption Spectrometry (GFAAS).

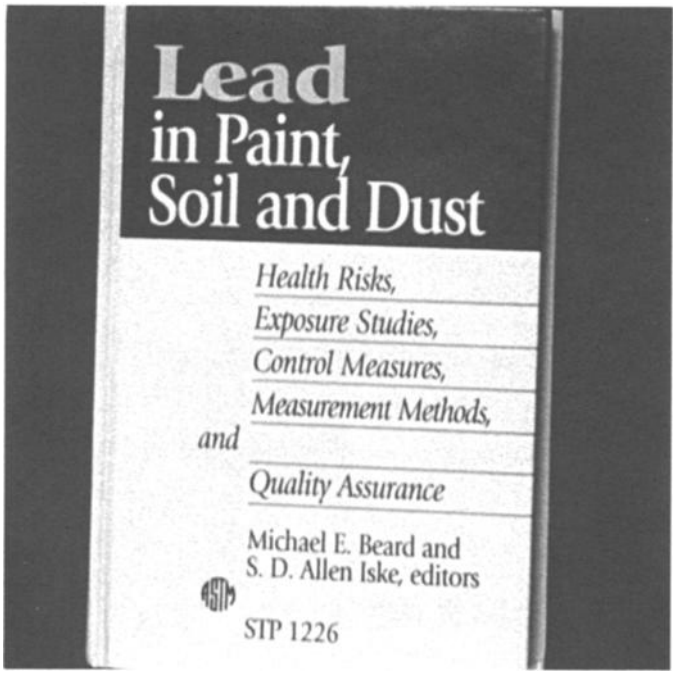


Figure 2.4: ASTM Publishes Standards and other Guidance Materials

E 1728
Standard Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques

This practice covers the collection of settled dusts on hard surfaces using the wipe sampling method. These samples are collected in a manner that will permit subsequent digestion and determination of lead using laboratory analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Absorption Spectrometry (GFAAS).

E 1729
Standard Practice for Field Collection of Dried Paint Samples for Lead Determination by Atomic Spectrometry Techniques

This practice covers the collection of dried paint samples or other coatings from buildings and related structures. These samples are collected in a manner that will permit subsequent digestion and determination of lead using laboratory analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Absorption Spectrometry (GFAAS).

E 1753
Standard Practice for the Use of Qualitative Chemical Spot Test Kits for Detection of Lead in Dry Paint Films

This practice covers the use of commercial spot test kits based on either sulfide or rhodizonate for the qualitative determination of the presence of lead in dry paint films. This practice may be used as a qualitative procedure for other dry coating films such as varnishes. In addition, this practice provides a list of the advantages and limitations of chemical spot test kits based on sulfide and rhodizonate to allow user to choose the appropriate spot test for a given circumstance.

E 1796
Standard Guide for Selection and Use of Liquid Coating Encapsulation Products for Leaded Paint in Buildings

This guide is intended to provide building users such as commercial and private building owners, contractors, architects, homeowners and regulatory authorities with assistance in selecting an appropriate liquid coating encapsulation product for normal use situations for abating lead paint. This guide also provides information that can be used to assist in the following:

- Determining whether a painted surface is suitable for encapsulation.
- Applying a liquid coating encapsulation product.
- Evaluating installed liquid coating encapsulation products, and
- Maintaining the encapsulated surface.

E 1908
Standard Guide for Sample Selection of Debris Waste from a Building Renovation or Lead Abatement Project for Toxicity Characteristic Leaching Procedure (TCLP) Testing for Leachable

This guide describes a method for selecting samples from the debris waste stream created during demolition, renovation, or lead abatement projects. The lead toxicity of the waste is then determined by analysis of the leachate from use of the Toxicity Characteristic Leaching Procedure (TCLP).

PS 46
Standard Practice for Collection of Surface Dust by Air Sampling Pump Vacuum Technique for Subsequent Lead Determination

This practice covers the vacuum collection of surface dusts onto filters using portable, battery-powered, air sampling pumps. Samples collected in this manner allow for the subsequent digestion and determination of lead content by using atomic spectrometric (or equivalent) methods.

2.3 Other helpful references and information

2.3.1 Technical books and publications

EPA 747-R-93-006

Applicability of RCRA Disposal Requirements to Lead-Based Paint Abatement Wastes

EPA/600/8-83/028bF

Air Quality Criteria for Lead Volume I-IV

EPA 570/9-89-001

Lead in School Drinking Water

EPA 747-B-98-002

Lead in Your Home A Parents Reference Guide

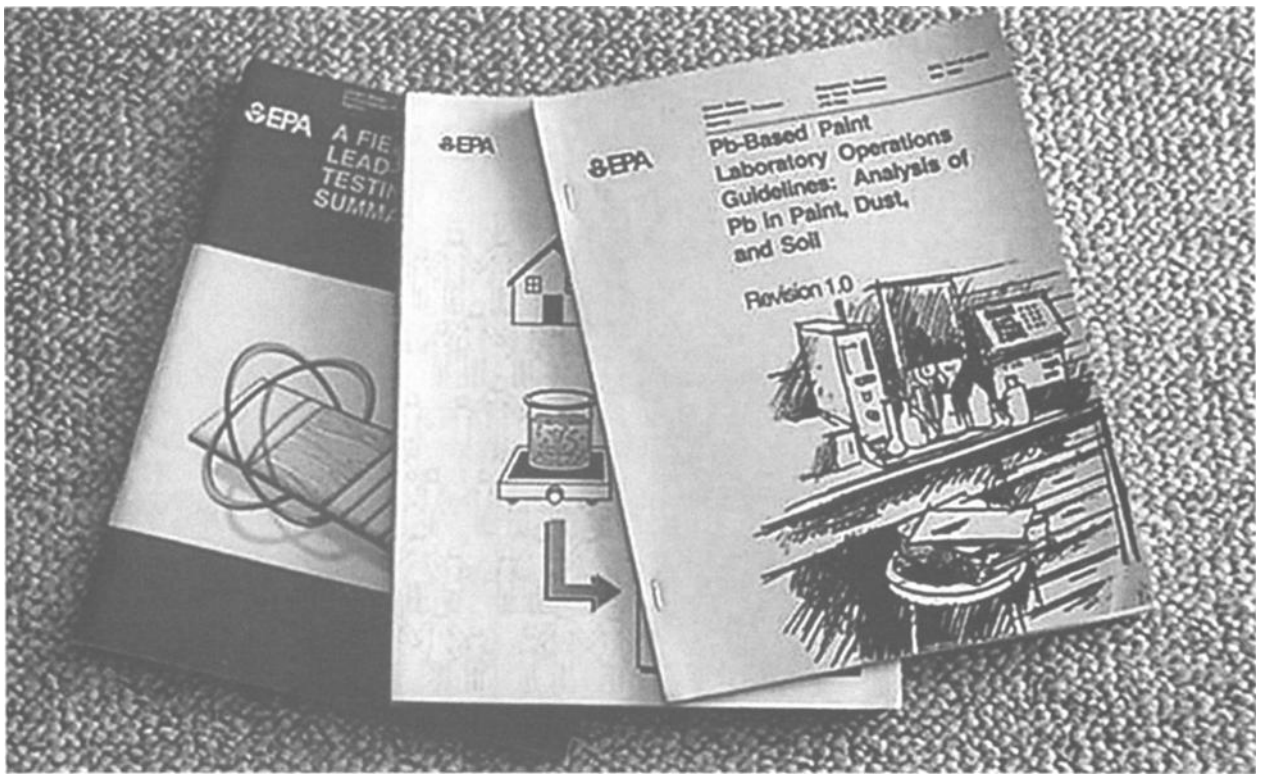


Figure 2.5: Additional Guidance is Available from Many Sources

EPA 747-R-94-002

Reducing Lead Hazards When Remodeling Your Home

Property Profiles, Inc.

Lessons in Lead (Lead education issues preschool-G12)
Tel: (616) 676-3640

Children's Safety Network at CSR, Inc.

Building Safe Communities Childhood Lead Poisoning Prevention: Strategies and Resources
Tel: (202) 842-4450

Wisconsin Childhood Lead Poisoning Prevention Program
Department of Public Health

"Look out for Lead"
Tel: (609) 266-5817

County of San Diego Childhood Lead Poisoning Prevention Program

Easy Ways to Keep Your Kids Safe From Lead (Pamphlet in English and Spanish)

Stop Childhood Lead Poisoning (English and Spanish)

Lead Poisoning and Constipation - How to help your child feel better (English and Spanish)

Lead Safe Coloring Book (English and Spanish)
Tel: (619) 515-6694

IAQ Publications, Inc.

Lead Poisoning (An Industry Report)

Encapsulants Coatings & Strippers

Lead Disclosure & Training

XRF Technology
Tel: (800) 395-0115

2.3.2 Other standards and methods

Methods for removing lead-based paint from steel structures are different from most residential abatement projects. The methods for this type of work is best outlined by The Steel Structures Painting Council.

2.3.3 Newsletters and Conferences

Deleading
Printed by the National Lead Assessment and Abatement Council
Tel: (301) 924-5490

Lead Detection & Abatement Contractor
Printed by IAQ Publications
Tel: (301) 913-0115

"Lead Tech" Annual Conference
Information Hotline
Tel: (800) 394-0115

The Environmental Information Association
Tel: (301) 961-4999
E-mail: info@eia-usa.org

2.3.4 Other Sources of Information

There are numerous web sites that provide information on lead. Several are described below.

http://www.hud.gov/lea/leahome.html

Office of Lead Hazard Control – This site provides access to lead hazard control information including guidance and regulations, technical studies, and grants and community outreach programs. The lead resources page also provides links to other useful sites such as EPA, Centers for Disease Control (CDC), National Conference of State Legislatures (NCSL), and the National Lead Information Center's Lead Clearinghouse.

http://www.epa.gov/lead/nlic.htm

EPA Office of Pollution Prevention and Toxics (OPPT) - The EPA site provides information regarding EPA regulations, lead programs, and technical reports and studies. The EPA site also provides links to HUD, National Lead Information Center, CDC, OSHA, and the Consumer Product Safety Commission.

http://www.leadlisting.org

National Lead Service Providers' Lead Listing – This web page lists lead consultants, laboratories, and abatement contractors by state. It has been developed to help consumers locate qualified lead service providers, renovators trained in lead-safe practices and recognized lead analysis laboratories in a timely fashion.

http://www.huduser.org

HUDUSER – sells lead documents in hard copy and CD-ROM formats, including the HUD Guidelines and the EPA 8-hour maintenance worker training package. The search term "lead-based paint" should be used to access links to lead information sites.

http://www.osha.gov

Occupational Safety and Health Administration – The OSHA web site provides the OSHA general industry and construction standards for lead as well as links to more helpful information on lead. The general search term "lead-based paint" can be used to gain access to this information.

CHAPTER 3: SUMMARY OF THE LEAD HAZARD MANAGEMENT PROGRAM

3.1 Purpose and Scope of the LHMP

The purpose of the program is to protect occupants, visitors, staff, other workers, and the environment from lead hazards in facilities, which are likely to be occupied or visited by children under six or by pregnant women. The ASTM Standard E 2052 and this handbook provide detailed guidance to property owners and managers on how to develop a lead hazard management program.

Figure 3.2 presents an overview of a lead hazard evaluation, management and control program. The topics discussed in this chapter make up a program, and are detailed in the chapters of this handbook.

3.2 Facility Classification

ASTM Standard E 2052 recommends one facility classification scheme, but does not discourage alternative systems. The ASTM facility classification procedure is intended to:

- Establish which facilities have leaded paint or lead hazards and set priorities for lead hazard management.
- Determine which facilities are likely not to have leaded paint or lead hazards and therefore do not need lead hazard management.

3.2.1 Class A, B, and C facilities

Outlined below is a summary of the ASTM facility classification system. The detailed criteria for each class of facility is given in chapter 5.

Class A facilities are those in which leaded paint or lead hazards are probable and include most facilities built before 1960.

Class B facilities are those facilities in which leaded paint or

Figure 3.1: Class A Buildings usually include those built before 1960

Figure 3.2: Lead Hazard Identification and Management Program Overview

Identification

Consider lead hazard program:
- Review scope of ASTM standard.
- Determine whether ASTM standard applies to the facility (ies).
- Continue if there are facilities likely to be occupied or visited by children under six, or by pregnant women.
- Stop if there are no facilities likely to be occupied or visited by children under six, or by pregnant women.

Categorize facility (ies) for lead hazards:
- Classify each facility as Class A, B, or C* based on initial information.
- Consider doing detailed evaluation in Class A and B facilities on a prioritized basis.
- If a facility is evaluated, retain or change classification based on resulting information.
- Response to classification:
  - For Class A and B facilities, document findings and prioritize facilities for action.
  - For Class C facilities, document findings.

Management for Class A and B Facilities*

Develop and implement lead hazard management program for:
- Routine maintenance and cleaning.
- Occupant education and protection.
- Environmental, safety, and health programs.
- Real estate transaction procedures.
- Elevated blood lead child response.

Prioritize lead hazard control work, if there is more than one facility.

Conduct lead hazard control projects as needed:
- Plan projects.
- Perform projects.

Monitor and re-evaluate on an ongoing basis

For all activities:
- *Use qualified persons and organizations.*
- *Sample and analyze as appropriate.*
- *Document activities and conditions.*

* *See Chapter 5 and Figure 5.3 for facility classification procedure:*
- *In **Class A** facilities, leaded paint or lead hazards are probable.*
- *In **Class B** facilities, leaded paint or lead hazards are less probable.*
- *In **Class C** facilities, leaded paint and lead hazards are not likely.*

lead hazards are less probable (than Class A facilities). These facilities were generally built since 1960, but before 1978.

Class C facilities are those facilities that are "likely not to have leaded paint", or lead hazards. Class C facilities were generally built in 1978, or later. A Class C facility does not require any further action under ASTM E 2052. However, applicable regulations or policies of the property owner may need to be implemented.

3.2.2 Initial facility classification

Useful information to collect for the evaluation and classification procedure are occupancy information, facility age, construction information, maintenance history, current condition, usage (current and past), location, and environmental conditions.

3.3 Management of Class A and B facilities

Class A facilities tend to require broader and more stringent lead hazard management plans and programs than do Class B facilities. This is because Class B facilities generally have fewer potential or actual lead hazards, which generally are of lower risk when they do occur.

3.3.1 Routine maintenance and cleaning

Maintenance and cleaning procedures are intended to minimize the generation of lead dust and to effectively remove lead-contaminated dust and lead-contaminated soil that has been brought inside buildings. As part of a program, facility owners or property managers should establish and implement a documented maintenance and cleaning program.

For all Class A and B facilities, the program should include the Essential Maintenance Practices specified in the "HUD Task Force Report" as a baseline. Any program should comply with OSHA regulations (29 CFR 1910.1025 or, for maintenance in conjunction with construction, 29 CFR 1926.62) and, as applicable, EPA waste regulations (40 CFR 261), and where applicable, state or local regulations. Use the "HUD Task Force Report" and the "NIBS Manual" as the primary sources of guidance for the program. Use HUD "Guidelines", Chapter 17 and "Task Force Report" for general guidance.

Maintenance and cleaning programs should be incorporated into lead hazard management programs where they are established.

3.3.2 Occupant education and protection

This program helps reduce the risk of lead exposure to occupants and visitors arising from the facility and other sources. It is also used to encourage the cooperation of occupants in managing lead hazards. Under this program, owners and property managers are responsible for educating and protecting occupants and tenants.

Figure 3.3: Class B Buildings were usually built before 1978, but after 1960

3.3.3 Environmental, safety and health programs.

Environmental, safety, and health programs for a LHMP are intended to protect personnel and the environment from lead hazards and related hazards. The effort required to establish and maintain programs varies greatly according to the nature of the work.

3.3.4 Real estate transaction procedures

Real estate transaction procedures are intended to ensure compliance with regulations to protect future occupants by ensuring the full disclosure of known lead hazards and potential sources of lead hazards.

3.3.5 Elevated blood lead child response

The procedure for responding to the identification of a child with an elevated blood lead level is intended to minimize the harm to the child. Response to an elevated blood lead level should be in accordance with the "HUD Task Force Report", "CDC Statement", "CDC Guidance", and the requirements of the state or local agencies having jurisdiction. Where response actions are not mandated by state or local regulations, performing voluntary actions are considered. "HUD Guidelines", Chapter 16, may be used as guidance. Any sampling and analysis should be performed in accordance with Section 18 of ASTM E 2052.

3.3.6 Prioritization scheme for multiple facilities

ASTM E 2052 has a prioritization scheme for use when implementing a program covering multiple facilities. This scheme is outlined below in descending order of priority.

1. The highest priority is given to responding to identified occupants with an elevated blood lead level (EBL); then, with all other factors among the facilities being equal:
2. Developing the plan and implementing the resulting program in facilities occupied or visited by children under six or by pregnant women, followed by other facilities; then
3. Developing the plan and implementing the resulting program in facilities designated as Class A, and then in Class B, while complying with applicable regulations in all facilities at all times.

3.4 Lead Hazard Control Projects

Lead hazard control projects are intended to control or eliminate lead hazards. These projects address the source(s) of exposure and do not include projects that are intended only to clean up leaded dust or soil without addressing the source(s) of the leaded dust or soil.

Figure 3.4: Class C Buildings were often built after 1978

3.4.1 Planning lead hazard control projects

Projects should be planned in accordance with all Federal, State, and local regulations and guidance. Planning of projects should be coordinated with all agencies having jurisdiction.

3.4.2 Conducting lead hazard control projects

Lead hazard control project planning and management procedures are intended to ensure that projects are performed efficiently while minimizing the risk of lead exposures to workers, occupants, and the environment, and in compliance with regulations.

3.5 Monitor and Re-Evaluate on an Ongoing Basis

Ongoing monitoring and reevaluation procedures are used in facilities in which potential sources of lead hazards have not been removed. They are intended to verify that control measures continue to be effective or to detect new lead hazards.

3.6 Program Management

3.6.1 Use of qualified persons and organizations

Qualification procedures for personnel are intended to ensure they are competent to maintain the quality of program functions. They are also intended to ensure compliance with environmental, safety and health regulations, and lead hazard control procedures.

All personnel who support the lead hazard management program should be qualified on the basis of training and, as appropriate, possess appropriate certification(s) or relevant experience. Qualifications, including initial training, refresher training, and certification must meet applicable regulatory requirements. Consultants and contractors should be responsible for ensuring that their personnel are trained and certified, as applicable. Possession of qualifications should be documented.

3.6.2 Sample and analyze as appropriate

Sampling and analytic procedures are intended to ensure that data are of sufficient quality to support decision-making throughout the implementation of the lead-hazard management program.

Sampling and analysis for all materials should be performed by qualified laboratories and personnel in accordance with applicable regulations, ASTM standards, or NIOSH, OSHA, or EPA methods. Specific guidance for various lead sampling and analytical techniques is provided in Chapter 17.

3.6.3 Maintain documentation of activities and conditions

Documentation procedures provide a record of how decisions were made and what information they were based on. These records also provide evidence that actions taken were in accordance with the plan.

A recordkeeping system should be developed that accommodates all necessary documentation, provides procedures for identification, collection, indexing, access, filing, storage, maintenance, and disposal of records. There should be a procedure to ensure that documentation is complete for each lead hazard management activity. Legal advice should be obtained as appropriate, to ensure that the content and the organization of records is adequate for legal purposes.

CHAPTER 4: BASIC MANAGEMENT ELEMENTS OF THE PROGRAM

4.1 Overview of Program Management

An effective Lead Hazard Management Program requires the use of many talents to coordinate the different program elements. Perhaps with a handful of exceptions, no single organization employs or individually possesses all the necessary skills to acceptably perform all the functions necessary to document, implement, and maintain an effective program. One person may be highly skilled in conducting facility lead hazard evaluations and lead risk assessments, but not be the effective educator needed to keep building occupants informed and encourage their cooperation. Another organization or individual may excel in the area of industrial hygiene, but lack experience in the field of construction management. The program manager will therefore need to assemble a knowledgeable team, whether it be in-house, or through consultants and contractors.

An effective program will ensure residents' exposures are maintained within acceptable limits, facility conditions are known, and lead hazard management activities minimize facility contamination. In addition, the LHMP will ensure the quality of the program, data, records and other elements are consistent. This is accomplished through the implementation, use, and maintenance of a documented program quality system. Many of the management elements and quality assurance procedures described in the following paragraphs apply to all parts of ASTM E 2052.

4.2 Selection and Qualification of Personnel

Personnel associated with the Lead Hazard Management Program often include the following:

- Program Manager
- Program staff
- Facility Maintenance
- Custodial staff
- Consultants
- Contractors
- Training providers
- Laboratories

Depending on the needs of the program it might also include persons or organizations with expertise in public relations, legal advice, architecture, contract management, and other disciplines. The following list provides an overview of the qualification procedure for personnel and organizations.

- Qualify lead program support personnel based on training, certification and experience, as needed
- For EPA certification disciplines, use EPA- or State-accredited trainers
- Have program managers & personnel who perform, supervise or manage evaluations or abatement be trained & certified per EPA/State regulations
- For disciplines not covered by EPA certification, use trainers per State criteria or EPA Title X criteria
- Personnel who may be exposed to lead at work must be trained per OSHA or state/local lead rules and other applicable regulations
- Consultants & contractors, and their key personnel, should be qualified by documented competence and compliance with quality criteria
- Analytical labs should be appropriately accredited. Use NLLAP-recognized labs for Title X work.

4.2.1 LHMP manager and staff

There are two basic approaches to selecting the program manager. One approach is to select an individual already affiliated with the facility and provide training and education regarding lead hazard management. The second approach is to hire someone knowledgeable in lead hazard management and provide training about the facility and systems in-place. There are advantages and disadvantages to each approach.

The program manager should have a clear understanding of the organization and the authority to perform the tasks necessary to implement, operate and maintain the program. Effective communication, organization skills, and basic understanding of lead hazard recognition and control are needed. Basic training for the program managers should normally include attendance at lead inspector, lead risk assessor, and lead hazard control project designer courses. Continuing education needs are met through participation in professional conferences, seminars and refresher training.

Depending on the program needs, in-house staff may be necessary or desirable. Smaller facilities, or those having only limited lead hazards, may choose to rely on consultants and contractors to perform many program functions.

Technical staff who perform facility inspections, lead risk assessments, design lead control projects, supervise lead control projects, or serve as a lead abatement worker must meet the qualifications, have attended the required training, and be certified according to the EPA requirements (40 CFR 745). Most states require certification to practice and have licensing programs to perform certain lead related activities. These states generally require certification and licensure based on where the activity is performed and the facility exists. For example, an individual performing lead risk assessments in three different states will need to be certified and/or licensed by each state. For those states (and territories) that do not have lead certification programs, the EPA will provide the necessary certification. These requirements are also found in 40 CFR 745.

In addition, the program manager and staff may need additional training as required by regulations. Common additional training will focus on the OSHA lead in construction standard, OSHA hazard communication standard and other safety and health related training. A training log should be maintained for each person indicating who performed the training, topic or topics, evidence of attendance, dates of training, and length of the course(s).

ASTM E 2052 recognizes that lead certification programs usually do not cover persons who design or supervise air monitoring for lead or those who design occupational health and safety programs. E 2052 recommends that persons who design or supervise air monitoring for lead should be an industrial hygienist with oversight by a Certified Industrial Hygienist (CIH), certified by the American Board of Industrial Hygiene (ABIH). The individual should have relevant experience in conducting air monitoring for lead.

Persons who design occupational health and safety programs should be industrial hygienists or safety professionals supervised by a CIH or Certified Safety Professional. A Certified Safety Professional (CSP) is certified by the Board of Certified Safety Professionals.

The maintenance staff of a facility plays an important role in controlling lead hazards. They need to know where leaded paint is located to avoid creating dust. For example, the maintenance staff needs to know which window systems contain leaded paint. They should also know that solder containing 50% lead remains on the market, but should not be used to repair water pipes. The HUD Guidelines recommend a useful training curriculum that maintenance workers and supervisors can complete in a one or two day program. Topics covered in this curriculum include:

- Definition of lead and lead-based paint hazards
- Health effects of lead exposure
- Applicable regulations
- Modifications to existing maintenance operations
- Listing of known or suspected surfaces or components containing lead
- Methods of identifying lead
- Distinguishing between low and high risk jobs
- Work practices and special equipment
- Prohibited methods of removing leaded paint
- Personal hygiene
- Worksite preparation
- Respiratory protection and fitting
- Medical surveillance
- Clean-up and post-job inspection
- Clearance procedures
- Waste handling and storage
- Occupant relations

Maintenance workers should not be permitted to perform lead abatement project activities unless they are certified, and in many states licensed, as lead abatement workers. The 8-hour maintenance worker course developed for EPA is available as an instructional package from HUD USER.

Custodians who work in Class A and Class B facilities also need to know how to select work practices that will not result in creating lead hazards. Proper cleaning techniques can play an important role in reducing the accumulation of lead-containing dust. The topics and work practices included in such training are described in Chapter 14 of the HUD Guidelines.

4.2.2 Consultants, contractors and laboratories

Most Lead Hazard Management Programs may find it necessary to rely on the services of consultants, contractors and laboratories to conduct various parts of the program.

Among the lead hazard management activities a consulting firm may be called upon to perform include:

- Lead hazard evaluations including paint characterization, lead-based paint inspections, risk screens, and/or lead risk assessments
- Developing the lead hazard management plan and making recommendations for lead hazard control projects
- Training, including curriculum development, tailoring curriculum to client-specific or site-specific conditions, training delivery and training evaluation
- Preparation of contract documents for repair, maintenance, alteration, capital improvements, and other projects, as needed

- Selecting the laboratory, facility management, maintenance, abatement, waste transporter, or waste disposal contractors
- Lead hazard control project management, site inspection, air monitoring, and clearance testing
- Ongoing monitoring and reassessment

Consulting firms, contracting firms, laboratories and their key personnel should be qualified on the basis of their documented competence and compliance with quality systems appropriate to their field. Any work that is done by others should be placed with firms that are appropriately qualified. Firms and/or individuals should be certified, licensed or accredited in accordance with 40 CFR 745, applicable state or local regulations, and in conformance with appropriate ASTM consensus standards.

ASTM Standard Practice E 1864, "Evaluating Quality Systems of Organizations Engaged in Conducting Facility and Hazard Assessments to Determine the Presence and Extent of Lead in Paint, Dust, Airborne Particulates, and Soil In and Around Buildings and Related Structures", provides detailed guidance to evaluate the quality systems and qualifications of consulting firms. Chapter 2 of the HUD Guidelines provides general guidance for selecting qualified consultants. The criteria to consider include the following:

- Qualifications of key personnel and others who will perform the work
- Certificates/licenses required by regulations
- List of all previous related projects for a specified time period (usually 1 or 2 years)
- Types of projects performed, locations, dates of performance, and brief summary
- Qualifications of sub-contractors or others that will perform parts of the work
- Quality system requirements appropriate to the type of work to be done (see ASTM Practice E 1864)
- Insurance carried and reliability of the insurance company
- Results of at least 5 reference checks to inquire of: the acceptability of work performed, performance within budget, knowledge of the consultants, general practices, and communication/cooperation of the firm or individuals working on the project.

The evaluation criteria for contractors to perform lead hazard control and abatement projects are similar to those listed above for consultants. An in-depth investigation of the insurance coverage offered is performed. Additional information is gathered concerning the contractor's record of violations for environmental, health and safety regulations. The consultant selected may have knowledge of contractors in a local area and previous experience concerning their competency.

The use of qualified laboratories is intended to provide data suitable for use obtained from an acceptable sample design using specified sample collection procedures. Federal regulations require laboratories recognized as proficient by the EPA's National Lead Laboratory Accreditation Program (NLLAP) perform certain analyses. Any laboratory performing lead analytical work should be accredited by an EPA recognized laboratory accreditation organization. Some states also require a separate state accreditation or license.

4.2.3 Training organizations and courses

Training providers for courses leading to certification should be listed by EPA or the state as qualified training providers for the lead certificate(s) desired. If not, they should meet the evaluation criteria listed in 40 CFR 745 and applicable state regulations. Principal instructors should meet the evaluation criteria in 40 CFR 745.

In most instances there will be several approved training providers from which to choose. If possible, talk to several past attendees and obtain their opinion about the courses. Did they find the course(s) provided them with the knowledge necessary to do their work? Were instructors receptive to questions days, weeks, or even months after the course was over? Do they plan to attend future courses offered by the training provider?

4.3 Obtaining Quality Data

Throughout the entire process of identifying, evaluating, managing and controlling lead hazards it is essential to have data that meet the project design specifications. These data will be relied upon to make plans and decisions that affect the health of occupants and the dedication of significant resources. If the data is not reliable, the consequences may be unnecessary risk to people and contamination of facilities.

As discussed previously in this chapter, obtaining quality data begins with qualified individuals and firms that will gather the data, conduct sampling, analyze samples, evaluate results, develop plans, write procedures, and perform the lead hazard control projects. Thoroughly trained personnel, who have demonstrated and documented competency ensures obtaining data and services that meet project specifications. In addition, refresher training ensures that those involved maintain their skills and keep up with changing requirements.
Even the most qualified and competent people make mistakes. Quality control procedures should be in place to find, correct, and prevent these mistakes from happening again. Additional procedures should also be in place to perform quality assurance reviews.

The specific procedures used to assure quality are different for each task performed. For example, in the laboratory a procedure is used to assure glassware does not contaminate a sample with lead from a previous sample it may have contained. At the conclusion of a lead abatement project there is a procedure used to determine if a surface is clean. It is not feasible here to list every conceivable procedure, but to focus on the elements common to most.

4.3.1 Developing sampling plans

When information or data are needed a plan should be prepared defining how the data will be gathered; who will gather it; where the data will come from; when the data will be gathered; and how and by whom it is documented. "Data", as used here, could be any sort of information necessary or desirable for the effective management of lead hazards. To formulate these procedures, it is necessary to know why the data is being gathered, and/or the sampling objective.

It is advisable to have a written sampling plan. "Sampling", as used here, can be any method used to gather the information needed. The written sampling plan may be based on written guidance such as that found in the HUD Guidelines and ASTM standards. The sampling plan could be based on requirements found in federal, state or local regulations. The sampling plan provides the details of information gathering. It should also state what standard methods will be used, quality control and assurance procedures followed, and review/validation procedures employed.

4.3.2 Using standard methods

Standard methods should be used when developing a sampling plan to collect data. Standard methods may be a standard practice, guide, sampling procedure, analytical protocol, and reporting format. To be a standard method, generally it has been tested and validated. Some standard methods may be required by regulations, or must be followed to maintain a professional certification or license.

Methods may have to be developed for unusual data or circumstances. When this arises, the method should be prepared by knowledgeable individuals, subject to peer review, have quality control and assurance procedures included, and be tested (validated).

Standard operating procedures will always need to be developed within each organization to define how procedures specific to that organization will be performed. For example, there exist "standard procedures" for implementing a work order system for working with leaded paint or leaded components in a facility. For any particular facility the standard procedure defines who will initiate the work order (building manager?, facility engineering?, maintenance department?), who will review the order, who will perform the lead-related work (maintenance staff?, outside contractor?), where the work order will be filed when completed, and what will happen to the files?

ASTM and other organizations have developed many standard (consensus) methods and procedures. Personnel developing lead hazard management programs should become familiar with these methods, and use them where feasible. Consensus methods may be used as a basis for a program's standard operating procedures; they simply need to be made program or site specific.

4.3.3 Quality system procedures

Quality system procedures exist at two levels. At the organizational level there should be an overall quality system. This is a written set of practices defining the roles and responsibilities of personnel, management's commitment to quality, review practices, training and other quality assurance functions. ASTM Standard Practice E 1864 provides detailed criteria for organizational quality systems.

The second level of quality system procedures is that applied to specific activities. For example, having a qualified consultant performing daily site inspections during a lead control project is a common quality assurance procedure. Calling attendees (or a selected percentage) from an occupant awareness seminar to determine what they understood is another quality assurance technique.

Standard methods may specify the level of quality assurance. Often, the individual must make a judgment on the level or "amount" of quality assurance desired. For data that is critical, 100% verification may be appropriate. For data of less importance, a somewhat lower level of quality assurance may be warranted.

4.3.4 Review procedures

Systematic review of each activity is necessary to obtain acceptable data. The purpose of the review is to determine if the record demonstrates that the plan was followed as written, standard methods followed, quality control and assurance procedures followed, and deficiencies noted and corrected. This review is the specific project plan review and different from the quality system audit of the program discussed later in this chapter.

The review of specific projects or tasks should be built-in to the process. The details of the review will vary with the specific task. Generally, reviews occur for all work in house. External reviews are usually used for program audits or when

major problems occur. Where errors are found, a corrective action investigation must be conducted. The results of the investigation are used to develop corrective actions that are implemented and evaluated for effectiveness. When the corrective action investigation demonstrates a need to change a practice or procedure, involved personnel are trained with the procedure.

4.4 Keeping Good Records

Maintaining good records allows a program manager to preserve data or information gathered and use it as a basis for decision making. Good records demonstrate that work performed met project specifications, and reliable data was obtained. In addition, good recordkeeping will allow independent parties to understand the basis for decisions.

The International Standards Organization (ISO) has defined a record to mean a document that furnishes objective evidence of activities performed or results achieved. This organization has defined objective evidence as information which can be proved true, based on facts, and obtained through observation, measurement, test data or other means.

4.4.1 Need for records

Records serve many purposes. Some records are required by regulations such as EPA or OSHA. The specific regulation will usually state exactly the form of the record and length of time it must be retained. Records are also maintained to preserve the data or information generated. Many building owners have endured the experience of having to conduct asbestos surveys 2, 3, or more times due to poor records that failed to record the necessary information. Other records failed to detail the methods and procedures employed leading to questions concerning the acceptability (quality) of past work.

Records serve as the basis for decisions. Where data was gathered appropriately, but due to poor recordkeeping, good acceptable data may be worthless because the detail needed to describe the data fully has not been recorded. Lastly, a survey of many professionals and managers would probably reveal records are prepared and maintained to satisfy legal requirements. What they really mean to say is records are prepared and maintained to demonstrate the work performed met the project plan specifications, and the data was reliable. Records are also essential in demonstrating work performed met the standard of care existing at that time.

4.4.2 Recordkeeping systems

Chapter 16 discusses the types of records that should be retained. How they are retained is equally important. At the outset of the program a system should be established for the identification, collection, indexing, filing, storage, maintenance, and disposition of records.

Records should be stored and maintained in such a way they are readily retrievable in facilities that provide a suitable environment for minimizing deterioration, damage, or loss. Record storage locations should be secure and confidential as appropriate or as their availability may be required by law.

Records may include reports, letters, and other common paper documents. They may also include photographs, videotapes, and electronic media such as computer disks.

4.4.3 Completeness of records

Records need not include every insignificant memo or scrap of paper, but should be sufficiently complete to permit an independent party to understand the basis for decisions. It should be possible from the records to permit recreation of an activity or event. For example, a leaded paint characterization report should permit another certified inspector to conduct the same inspection, following the same methods, find substantially the same results, reach the same conclusions and make similar recommendations.

A common problem is failing to "close the loop on questions" raised in a document. One record may contain recommendations for corrective actions or raise concerns about the acceptability (quality) of some work. There should be a corresponding document that responds to the recommendations, addresses the concerns, or resolves discrepancies raised in documents.

4.4.4 Required and recommended records to keep

The lead hazard program manager should be familiar with federal, state and local regulations applicable to their facilities and activities. These regulations will dictate the records that must be kept and the minimum length of time they must be retained. Some records may need to be kept for 30 years or more.

Beyond regulatory requirements, program managers are advised to seek legal counsel to assist in deciding how long to retain various records and the level of detail needed for complete records. As a general rule, most records should be retained for at least ten years or for as long as they will be relied upon, whichever is longer.

Exactly which records will be retained will be dependent on what records are generated. The following is a checklist of those most commonly found.

- Lead hazard management plan
- Tenant notifications
- Lead hazard evaluation records
- Lead hazard control projects
- Air monitoring data
- Medical surveillance records
- Blood lead screening levels
- Waste transport and disposal records
- Maintenance records
- Qualifications of personnel, consultants and contractors

4.5 Program review and audit

As a quality system function, the lead hazard management program management team should review quality systems, at least annually, for its continuing effectiveness in meeting its objectives and make needed changes. Essential to these management reviews is an effective internal audit program and an effective corrective and preventive action program. Data from the internal audit program and the corrective/preventive action program are used in the management review process. A formal internal audit program should be in place with audits scheduled on the basis of importance. The quality system should be completely audited at least annually. Changes to the program should be implemented based on these internal audits.

The purpose of continuing internal audits is to recognize program deficiencies and implement corrective measures rapidly. For example, an occupant education procedure called for distributing written materials about the potential lead hazards along with actions the occupants can take to minimize the risk of exposure. Subsequent observations found no significant change in the occupants' behavior or activities to help reduce exposures. However, for another group of occupants a seminar was provided in addition to the written materials. A significant change in the occupants' attitudes and activities regarding lead hazards was then observed. Implementing a seminar for the occupants was successful. Based on these findings the program manager changed the occupant education procedures to include a videotape "seminar" for new occupants and an annual meeting and seminar for all occupants.

A formal internal audit performed annually and at other times when complaints are received is essential to maintaining an effectively operating program. Appropriate times would be when new regulations are issued which might affect the lead hazard management program. Other appropriate times would include the acquisition of additional facilities, a significant change in available resources, and a major change in facility management or ownership.

The audit may be conducted in-house or through an outside organization. The advantage of conducting the audit internally is that the individual(s) conducting the audit are more familiar with the program than an outside organization. The advantage of an external audit is that the auditors will be able to provide an independent evaluation. Any audit should be based on an audit plan which defines the audit scope and data collection tools which document the audit findings. A complete audit evaluates each element of the program.

Results of the program audit should be documented in a formal report disseminated to the program staff, management, and outside organizations affiliated with the program (as appropriate). A plan to correct any deficiencies found should be prepared and implemented. Follow-up review should be performed to document and evaluate the effectiveness of deficiency corrections.

CHAPTER 5: COLLECTING INFORMATION ON FACILITIES

[This chapter corresponds to ASTM E 2052, section 6]

5.1 Purpose and Advantage of Building Classification

The purpose of the ASTM E 2052 building classification scheme is to categorize buildings by their likelihood of having lead hazards. Once this is completed, the appropriate evaluation and control tools may be efficiently applied to manage the lead hazards. The classification scheme also provides a rational method to prioritize buildings and allocate limited resources.

5.2 The Building Classifications

ASTM E 2052 suggests a building classification scheme largely based on the year of construction. The standard does not require this scheme be used. For example, one program manager might classify his or her buildings built at the same time according to occupancy characteristics. Another program manager might develop categories based on a proposed renovation schedule. These classification methods are acceptable under the standard if they are based on objective data and reasonable assumptions. Described in this chapter is the suggested ASTM E 2052 classification scheme.

The ASTM building classification scheme sorts buildings into Class A, Class B, and Class C buildings. In general, Class A buildings are those with the greatest likelihood of lead hazards and Class C are those with the least likelihood of lead hazards. Building classifications are largely based on the age of the facility, but also take into account renovations, paint history, environmental sources of lead, and other factors. Sub-classifications designated A1, A2, B1, B2, etc. are useful to further categorize and prioritize facilities.

5.2.1 Class A facility criteria

Class A facilities include any built before 1960, and any other facility known to have significant areas of deteriorated paint that is known or can reasonably be presumed to be leaded. Class A facilities also include those which are known or can reasonably be presumed to have other extensive lead hazards. If upon investigation the Class A facility reveals a complete and reliable history that excludes the past use of lead-containing paint and excludes the occurrence of activities with the potential to create lead hazards, the facility may be placed in the Class C category.

5.2.2 Class B facility criteria

Class B facilities generally include any facility built in 1960, or later, but before 1978, unless there is a complete and reliable history that excludes the past use of lead-containing paint and excludes the occurrence of activities with the potential to create lead hazards (which puts the facilities into Class C). Class B facilities can also include newer facilities built in 1978 or later if any one of the following statements are true.

- There is specific evidence that lead-containing paint, including pre-1978 paint stocks, paint sold for nonresidential use, or imported paint has been used.
- The facility has an environmental source of lead contamination, such as:
  - An outdoor steel structure, industrial lead source, or mining lead source located within several hundred yards (meters).
  - Building components or owner-supplied fixtures or equipment that have been identified as sources of lead hazards by an appropriate agency, such as lead-containing vinyl miniblinds.
  - The facility in which an industrial process or hobby likely to produce lead contamination has been or is being performed in a common area or about which the owner or lessor has been or reasonably should be aware.
  - The owner or lessor of the facility has been notified by the local water authority that lead levels in tap water exceed the EPA Action Level listed in 40 CFR 141. In January 1999, the Action Level was 15 µg/l (15 ppb; 15 parts per billion).

5.2.3 Class C facility criteria

Class C includes those facilities built in 1978 or later. It may also include facilities built before 1978, if there is a complete and reliable history that excludes the past use of lead-containing paint and excludes the occurrence of activities with the potential to create lead hazards. If there is significant uncertainty about the basis for classifying a facility as Class C, the facility should be classified as Class A or Class B instead.

5.2.4 Application of sub-classifications

One of the important reasons for placing facilities into different classes is to prioritize the use of resources most efficiently. Sub-classification of facilities is one way to do this. Sub-classifications are particularly useful for owners or lessors with a large number of facilities or housing units. The general intent of sub-classifications is to further divide the facilities within one Class (A or B) into groups likely to have similar risks of containing lead hazards. The most common criterion used to establish the sub-classifications is age of the facility.

For Class A facilities ASTM E 2052 suggests creating sub-classifications of A1 for facilities built before 1950, and A2 for facilities built in 1950-1959. The basis for these sub-classifications is that the concentration of lead in paint sold before 1950 was, on average, higher than the concentration of lead in paint sold in 1950-1959. Accordingly, facilities in the Class A1 would have a higher potential for lead hazards than Class A2 facilities.

Similar sub-classifications for Class B facilities based on construction age may be established. For example, facilities built after 1960, but before 1973, may be designated Class B1. Facilities built after 1972, but before 1978, may be designated Class B2.

Sub-classifications may also be applied based on criteria other than age. The amount of painted surfaces is one criterion that may be used. The proximity of facilities to a known or suspected environmental source of lead is another useful criterion for establishing sub-classifications. The relative concentration of lead in drinking water is a third possible criterion.

Example: A housing authority has 32 buildings built in the 1940s which the lead hazard program manager has placed into sub-classification A1. The records indicate the exterior windows and doors were replaced in 1976 in 20 buildings, as part of an energy-saving program. The remaining 12 buildings have their original exterior windows and doors. Based on this information the program manager classifies the 12 buildings as Class A1a, and the 20 buildings as Class A1b.

Example: An owner of 3 apartment buildings built in 1980-1982 notes that one building located across town from the others is about 100 yards east of a brass foundry. He reclassifies this one building to Class B. The others remain in the category Class C.

Sub-classifications may be established based on known occupancy characteristics of the facilities.

Example: An owner has an apartment complex built in 1974. He notes the two and three bedroom units have a significantly higher population of children than the one-bedroom units. Based on this information he places the buildings having two and three bedroom units into Class B1 and buildings with one-bedroom units into Class B2. In this instance the sub-classification is not based on the relative amount or concentration of potential lead sources, but the characteristics of the exposed population.

5.2.5 Consideration of applicable federal, state, and local regulations

Current applicable federal, state and local regulations may affect the classification or sub-classification of facilities for a particular owner or lessor. For example, if a local ordinance requires a lead-based paint inspection for leased residential housing built prior to 1980, the cut-off date used for Class C facilities should be extended to pre-1980 facilities.

5.3 Determination of Facility Age

The age of a facility is an important piece of information to properly classify the building. For residential buildings constructed in the late 1970s the actual construction date is important to determine the applicability of certain regulations. While written documentation establishing the construction date is ideal, interviews and limited on-site investigation may be necessary.

5.3.1 Historical document review

If available, the construction documents should be requested. Drawings, specifications, construction contracts, change orders, surveys, and building permits are all useful sources to establish the construction date. A title search or review of deed filings at the local courthouse may provide some clues, but recognize that these documents normally refer to the property ownership and not necessarily the structures erected on it.

An approximate age of the building may be established by reviewing topographic maps, aerial photographs, and fire insurance maps. These resources are not updated annually so significant gaps will be present.

Example: Review of 6 aerial photographs found at the U.S. Department of Agriculture (USDA) County Extension Office show a particular building present in a 1974 photograph, but not in a 1968 photograph. This information can establish the construction date was between 1968 and 1974.

Interviews with the current owner or manager will often be the means to establish the date of construction. They may have built the building(s) or purchased the building(s) from the owner that did. Additional interviews with neighbors or others having knowledge of the building(s) or area may also be helpful. The information gained through interviews should include the person's name, contact information, date, and connection with the property (e.g., owner, manager, maintenance engineer).

An on-site inspection may establish the construction date or be useful to confirm a previously estimated construction date. A commemorative plaque or cornerstone may date a building. If the original mechanical, plumbing or electrical systems remain, additional information may be available. Dates are sometimes present on furnaces, boilers, hot water heaters, heat exchangers, and electric switch boxes. The investigator should remain aware that such facility components may have been replaced over the years, and the date located on such an item may not be an accurate representation of the date of construction.

5.3.2 Construction, renovation, remodeling projects

Most buildings originally constructed prior to 1978 will have undergone several construction, renovation or remodeling projects. To the extent the scope of these projects and the time frame can be determined, the information can be useful in facility classification, and in facility evaluations for lead hazards.

Example: The original construction of a building may have been in 1965. In 1982, a new wing effectively doubling the size of the building may have been added. This information could permit a change in classification. The original 1965 building would remain classified as Class B, the "new" wing would be re-classified as Class C. (This example assumes there were no other recognized environmental sources of lead exposure affecting the new wing.)

Renovation projects can have the effect of reducing the risk of lead hazards, and in some instances, increase the risk of lead hazards.

Example: A housing development built in the 1940s was gutted in the early 1970s. The interiors were completely replaced as well as all the windows and doors on the outside. Assuming the remainder of the buildings are unpainted brick, the facility classification would change from Class A to Class B. The program manager would note that lead in soil may be a concern since the renovation in the 1970s may have left residual lead-based paint in the soil around the buildings.

Example: A building built in 1965 was just renovated within the past 3 months. Little attention was paid to the possibility of lead hazards since no program was yet in place. In this instance, the renovation itself may have created significant amounts of lead-containing dust. This information should elevate this building to a high priority for a lead hazard assessment.

Remodeling projects can have a similar effect as renovation projects. Remodeling projects that include application of wallpaper, painting, and even replacement of carpets can effect the risk of lead hazards in a facility.

5.3.3 Building history versus paint history

The building history serves a useful index of the likelihood that lead-based paint was used. It may also provide some additional information regarding other lead sources, such as lead-containing plumbing fixtures, or a ceramics shop in a common area. A paint history requires considerably more detailed information that is often not available. However, when available, the paint history is valuable information. Construction specifications that show the finishes used provide some indication of the dates, locations, and even the types of paints applied. Some owners have a policy that calls for repainting the interiors every 5 years (or during tenant change over), and the exteriors every 7 years.

Some lead hazard program managers may find it valuable to perform some on-site investigation to establish a paint history. This can sometimes be performed visually by examining paint chips with a hand lens to determine paint colors and layers. The assistance of specialized analytical tools may also be useful. The side scanning electron microscope can identify each layer and determine which layers are lead rich. This type of detailed investigation is beyond what is normally performed, but available as an additional tool when needed.

5.3.4 Establish best available data

The quality of the data or information used to classify facilities is just as important as the quality of the data obtained from a lead-based paint inspection or assessment. The individual performing the classification should reference or retain sufficient documentation to allow a second person to review the data and find the same results.

The data relied upon for facility classifications normally fall into three categories. These include document reviews, interviews and observations. Any of these information sources should be properly documented. For documents, the name of the document, author, brief description (e.g., construction specifications for Mt. Holly Apartments), where the document

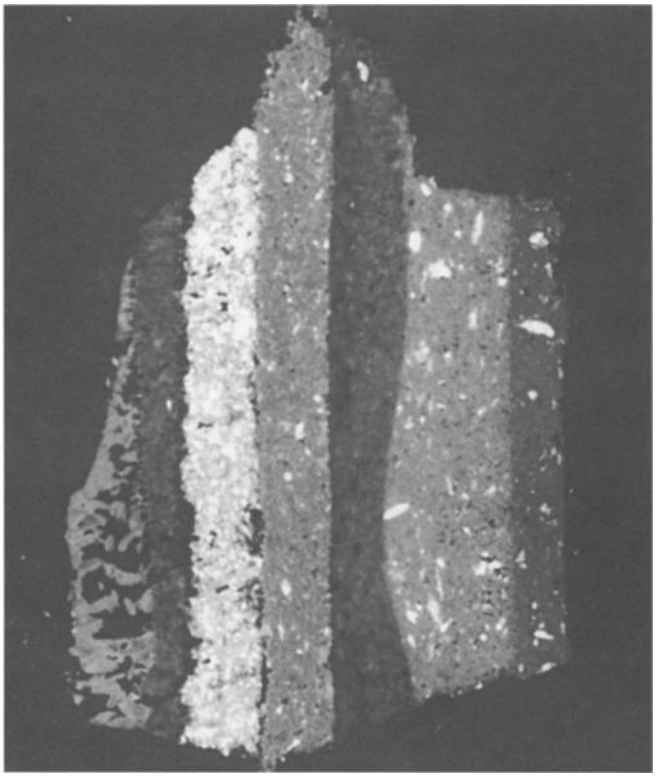


Figure 5.1: SEM Micrograph of paint layers (courtesy of MVA, Inc.)

is located, and the date of the document should be recorded. Documentation for interviews should include the name of the person conducting the interview, the name and title of the person being interviewed, a summary of the person's responsibilities (e.g., property manager, 1994-present), and the pertinent findings or information obtained. For observations, the person who made the observations, date and documented time observations were made, location of the observation, and a brief summary of the findings (e.g., the boiler manufacturer's data plate was stamped 1964) should be documented.

To the extent possible, historical data used to classify buildings should be confirmed by a second source or reference.

Example: An interview with the property manager determines a facility was constructed in 1965. This can be confirmed by review of construction drawings also dated 1965. If the construction drawings state 1968, these are likely more accurate than memory spanning back 30 plus years. As a general rule, documents created closest to the time of the activity (such as a construction or renovation date) will be more accurate than those documents created later, or personal recall of events long past.

Chapter 4 of this handbook provides additional guidance concerning the quality of data necessary to implement and manage a lead hazard program.

5.4 Classification of Building/Facility Usage

The type of facility will influence the design and implementation of the lead hazard management plan. The type and use of a facility may also affect the classification of the buildings, and the applicability of some regulations.

5.4.1 Residential, institutional, commercial, or industrial

The first step in determining facility usage is to classify it as a residential, institutional, commercial, or industrial facility. Local zoning maps can provide some information, but can be misleading as to the actual use of a building or facility. For example, most local zoning ordinances permit persons to live at a property zoned commercial. The best way to determine the type of facility or building is to make a site visit.

A residential property is real property on which there is situated one or more dwelling units used or occupied, or intended to be used or occupied, in whole or in part, as the home or residence of one or more persons. A commercial building or facility is one that houses a business that engages in trade or commerce. Typical commercial buildings include office buildings, retail stores, restaurants, and hotels. Institutional buildings include hospitals, schools, churches, libraries, and similar buildings. An industrial facility connotes foundries, steel plants, manufacturing plants, refineries, and power plants, to name a few.

5.4.2 Child occupied, child visitation, no children

The scope of E 2052 includes facilities occupied or visited by children under the age of 6 or pregnant women. When classifying facilities it is important to know if the facility is child occupied or one that is subject to child visitation. Some facilities will not be subject to either child occupancy or visitation. For most buildings and facilities this determination will be rather simple. For some facilities it is unclear. Within the current EPA regulation, "Lead-Based Poisoning Prevention in Certain Residential Structures" a child occupied facility is defined (40 CFR 745.223). EPA specifies a child occupied facility to be a building, or portion of a building constructed prior to 1978, visited regularly by the same child under 6 years of age, on at least two different days within any week (Sunday through Saturday), provided that each day's visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60

hours. This definition includes most day care centers, preschools, and kindergarten classrooms.

To determine if pregnant women occupy or visit the facility, the same exercise as described above may be followed. Some lead hazard program managers may simply note (1) if the facility is occupied by pregnant women, or (2) if it is visited by pregnant women. This information can then be used to help set priorities for lead hazard evaluations or control projects.

5.4.3 Occupational lead hazard sources

The National Institute for Occupational Safety and Health (NIOSH) has listed 151 occupations with potential exposures to inorganic lead. Some of the more common ones are listed in 5.1.

Occupational sources of lead hazards if present in the facility or in a common area of the facility may effect the classification of the facility or the priority of the facility for lead hazard evaluation or control activities. A not so unusual example of an occupational lead source would be a residence with a welding or auto body shop attached.

5.4.4 Non-occupational lead sources

Non-occupational lead sources referred to here are those generated by the occupant's activities that are not occupational. Typically these sources include hobbies that generate lead-containing dust or fumes. Examples of such hobbies include pottery making, art restoration, furniture refinishing, jewelry making/repair, enamel work, tile cutting, auto body work, and some metal working such as welding. Another rather common non-occupational lead source is the use of painted wood for burning in a fireplace or wood stove.

5.5 Building Environment and Location

The physical location of the facility may place it in the vicinity of external lead sources. The most common external lead sources are industrial processes that emit lead and painted steel structures. In certain areas of the country there are naturally occurring lead sources that may need to be considered.

A new facility initially classified as a Class C facility based on its post-1978 construction date may need to be reclassified as Class B if an external source of lead, sometimes referred to as an environmental lead source, is present.

Table 5.1: Common Occupations with Potential Occupational Exposure to Inorganic Lead

- Acid finishers
- Auto body shop workers
- Battery makers/workers
- Brass founders
- Braziers
- Cable splicers
- Ceramic makers
- Demolition workers
- Electroplaters
- Enamel makers
- Foundry workers
- Insecticide makers/users
- Metal Grinders
- Pipefitters
- Plumbers
- Rubber makers
- Ship dismantlers
- Solderers
- Tannery workers
- Tile makers
- Welders

ASTM E 2052 suggests that such external sources be considered relevant if within "several hundred yards" or meters of the facility. This rather vague wording was intentional since the potential lead hazard exposure risk posed by each external source needs to be considered on a site-specific basis.

Information relating to the lead in water supplies for the community and a review of available community blood lead screening data may also prove valuable.

5.5.1 Known or suspected outdoor sources of lead

5.5.1.1 Industrial sources of lead

Industrial sources of lead include emissions (typically airborne) of lead particles, which settle to the ground in the vicinity of the source. Increased regulation by the EPA on source emissions and allowable airborne lead concentrations at the property line has greatly reduced the magnitude of this potential lead source.

Typical industrial sources include metal smelting operations, particularly lead and copper. Brass and bronze foundries have traditionally been significant industrial sources. Other

Figure 5.2: Industrial emissions can be a source of lead.

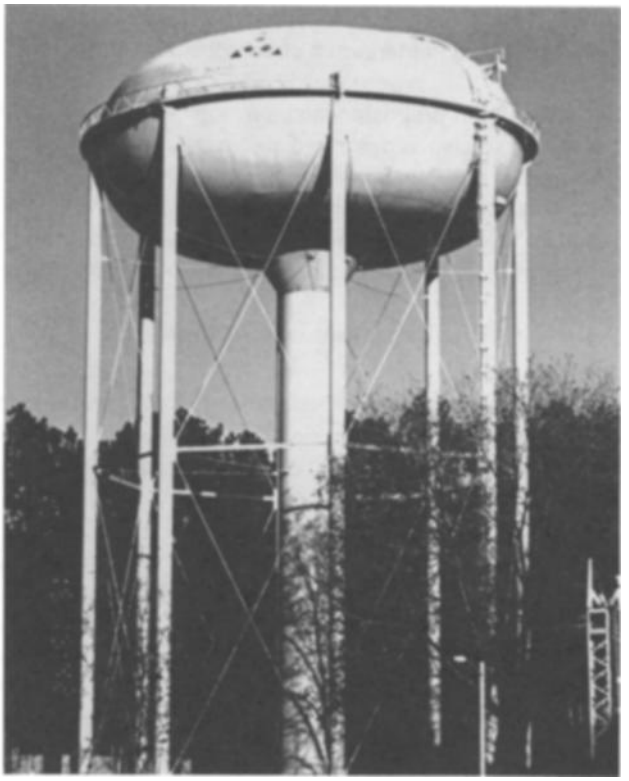


Figure 5.3: Large steel structures can be an environmental source of lead.

common sources include metal scrap yards, battery breaking plants, and shipyards.

5.5.1.2 Proximity to painted steel structure

A facility in close proximity to large steel structures may have an increased risk of having lead hazards. The source of lead is from paint, which has flaked from these structures over the years and fallen to the ground. The use of lead-based paint for non-residential applications was not limited to pre-1978. Typical painted steel structures include metal water towers and bridges.

5.5.1.3 Naturally occurring sources

Naturally occurring lead sources found in some areas of the country can present lead hazards. While there is some evidence that naturally occurring inorganic lead is less toxic than refined lead, current regulations treat them similarly. Lead from naturally occurring sources can result in high lead in soil or water content. Mine tailings present a special problem in some communities. For example new facilities constructed in the fashionable town of Aspen, Colorado often have to take special lead hazard control measures to prevent or minimize the lead hazard from old mine tailings.

5.5.1.4 Other exterior lead sources

There may be other exterior or environmental sources of lead which affect a facility. Often such other sources are discovered and found to be a result of some past industrial practices. In one example, high soil lead was found to have resulted from past cable washing where copper cables were burned and the lead oxide sheathing washed off down a hillside. In another example, elevated lead in surface dust of an entire community was found. The source was believed to be from a former lead arsenate pesticide plant located upwind. A more common source of exterior lead is the burning of scrap painted wood.

Some property owners now routinely have an environmental site assessment performed, which includes a search of multiple databases. These databases will reveal if there is a known Superfund site or known reported spill within a specified radius of the facility. Fences are another common source of outdoor lead. Painted ornamental wrought iron, cast iron and steel fences, gates, and handrails may pose a source of lead exposure.

5.5.1.5 Playground equipment

Painted playground equipment can be an outdoor source of lead. Generally a community playground is considered a common area of a facility. The facility usually includes the buildings that house the children using the playground. This could include a group of homes, apartments, a day care center, or a school.

5.5.2 Review of lead in water data

A standard piece of information that should be included when gathering information on a facility is the results of the water tests for lead content. The EPA has mandated that public water supplies be tested under the authority of the Clean Water Act. The current limit for lead in tap water is 15 parts lead per billion parts of water. This information should be readily available from the local water authority. Data for individual private wells may not always be available.

5.5.3 Review of available community lead screening data

The results of blood lead screening data for children in the community should be reviewed if available. The county health department should be the first contact to determine this information. Blood lead levels found above 10 micrograms per deciliter (μg/dl) in the surrounding community should be a cause for concern. Elevated blood lead levels found among children within the facility require an immediate response. Note, the current CDC guidance recommends intervention when a single test for a child is over 20 μg/dl or two consecutive tests, three to four months apart, show 15 μg/dl or above.

5.6 Previous reports and evaluations

In the process of gathering data on the facility, previous lead-based paint reports should be reviewed. This includes reports for the buildings at issue, as well as other reports that may be available on similar buildings. Additional reports, including environmental site assessment information should be reviewed, if available.

5.6.1 Previous lead-based paint inspections/assessments for specific buildings

Lead-based paint inspection or lead hazard assessment reports should be reviewed, if available. These reports may be as simple as several sample results collected to determine if some paint was leaded. Others may be more extensive surface-by-surface evaluations of the paint, and may include dust tests for lead. When reviewing these reports the quality of the work performed should be assessed. The quality of the data will determine the degree of reliance that should be placed on the data. Ideally, the reports should have been prepared by a certified or licensed inspector or risk assessor using a laboratory accredited to perform lead analyses. The information should be similar to that described in Chapter 6 of this handbook.

Reports and data results that appear lacking in quality or completeness should not be summarily discarded. This existing data may be confirmed or augmented through additional evaluation.

5.6.2 Previous lead-based paint inspections/assessments for similar buildings

In some instances there may be lead-based paint inspection reports or lead hazard risk assessment reports for similar buildings. The similar buildings may be located near the buildings at issue, or at some distance (i.e., across town). While this information is not as valuable as reports for the specific buildings at issue, they may be useful to gain some insight to the magnitude of the potential lead hazards in the area.

5.6.3 Environmental site assessment information

It has become a common practice since the 1980s to conduct environmental site assessments prior to the purchase of commercial or industrial properties. An environmental site assessment is an investigation of a property for recognized environmental conditions or concerns. The standard practice adapted by most environmental site assessors is ASTM E 1527, and its related standard ASTM E 1528.

Environmental site assessments focus on the property and do not address lead-based paint. Some assessors may take a paint chip sample (or several) to get a "rough idea" about the predominant paint; however, usually no sampling is performed.

The environmental site assessment will often identify previous owners and uses of the property, as well as current uses of the surrounding properties. They often contain results of database searches for known or suspected hazardous waste or spill sites within a specified radius of the property.

5.6.4 Other reports and data

There may be other reports or data that will provide information relevant to potential lead hazards at the facility.

For example, notices of building code violations may provide some insight into the overall condition of the facility.

5.7 Building Maintenance and Construction Information

When compiling information about facilities, records of building maintenance and construction activities can provide some clues regarding the presence of lead-containing materials in the facility. These materials will usually fall into two broad categories, paints, and other possibly leaded components.

Table 5.2: Some Common Names of Lead and Lead Compounds

- plumbum
- Naples yellow
- Cerussete
- ceruse
- Cotunite
- chrome yellow
- Leipzig yellow
- primrose yellow
- Austrian cinnabar
- plumbous oxide
- Cassel yellow
- Mendipite
- Auglisite
- Altaite
- mineral orange
- Saturn red
- Antimony yellow
- Galena
- cerussite
- hydrocerussite
- Matlockite
- cologne yellow
- Paris yellow
- American vermillion
- litharge
- Massicot
- laurionite
- Clausthalite
- Mulhouse white
- gold satinobre
- Paris red

Adapted from "A Guide to the Work-Relatedness of Disease", edited by S. Kusnetz, M.S. and M.K. Hutchison, M.D., U.S. Department of Health, Education, and Welfare, DHEW (NIOSH) Publication No. 79-116, January 1979

5.7.1 Paint history of building

Section 5.3.3 described the difference between the construction history of a building and the paint history. Construction documents, including plans and specifications may indicate the type of paint requested. Contractor's submittals approved for use will be more definitive on what was actually used, as compared to what was specified. Appendix B lists common names used for various lead compounds.

5.7.2 Use of other leaded components

Construction documents may indicate other possible leaded components used in a facility. Lead components were frequently used in association with roof construction, chimneys, vent pipes, gutters, downspouts, pipes and plumbing fixtures.

5.8 Documentation of Building Classification Information

The supporting documentation (or copies) relied upon for information used to classify buildings should be maintained on file. Documents that cannot be maintained, such as original construction drawings, should be referenced and a notation included where they are located, if needed in the future.

5.8.1 Building information checklist

Outlined below is a checklist of suggested information sources that should be consulted to gather information about the facility. The information will initially be used to classify the buildings. It may subsequently be used to apply subclassifications and prioritize lead hazard evaluations and control projects.

- Manager/Owner interview
- Facility type
- Facility use
  - child occupied
  - child visitation
  - pregnant women
  - women of child-bearing age
- Occupancy characteristics
- Construction documents/dates
  - building materials
  - piping/plumbing
  - flashing/roof/gutters
  - paint history
- Renovation records/dates
- Maintenance records
- Previous lead hazard reports
  - same facility
  - similar facilities
- Blood lead data
  - same facility
  - community
- Water source
- Lead in water test data
- Previous uses of property
- Environmental site assessment reports

- Painted steel structures
- Industrial sources nearby
- Natural lead sources
- Occupational lead sources
- Hobbies/related sources
- Applicable regulations

5.8.2 Applying the ASTM E 2052 flow diagram to establish building classes

Figure 5.4 shows how information gathered about the facility can be used to classify buildings into Class A, B or C. The lead hazard program manager may wish to further categorize buildings into sub-classifications as described earlier in this chapter. Once the buildings are classified, the lead hazard management program is developed and implemented for Class A and Class B facilities. As lead hazard control projects are performed, buildings may be reclassified. For example, if all leaded paint is removed from a Class A building, and there are no other known or suspected sources of lead, it should be reclassified as a Class C building. Two examples of applying the building classification scheme are given below.

5.9 Examples of the ASTM Building Classification Scheme

Described in sections 5.9.1 and 5.9.2 are two example applications of the ASTM suggested building classification scheme

5.9.1 Municipal housing agency with 40 buildings and 600 units

In this example, a municipal housing agency has 40 buildings each with 15 units (600 units total). Twenty of the buildings were built in 1974-1975, and are located south of town next to the industrial park. The industrial park has a water tower and several smoke stacks, one of which serves the Bon Air Brass foundry. The other 20 buildings are on the north side of town and believed to have been built in 1955-1957. Ten of the north buildings were extensively renovated in 1991-1993. During this renovation, all lead-based paint was removed from these 10 buildings. Available documentation indicates appropriate work practices were used and clearance sampling was performed. Additional testing and observations at the north buildings indicate no industrial, environmental, or hobby source of lead, or high drinking water lead levels.

Applying the ASTM classification scheme in this example, the 20 buildings located on the south side of town are classified Class B. The rationale for this is they were constructed prior to 1978, but after 1959, indicating they may have leaded paint. They also may have environmental lead sources from the brass foundry and the water tank. These findings further support the Class B designation.

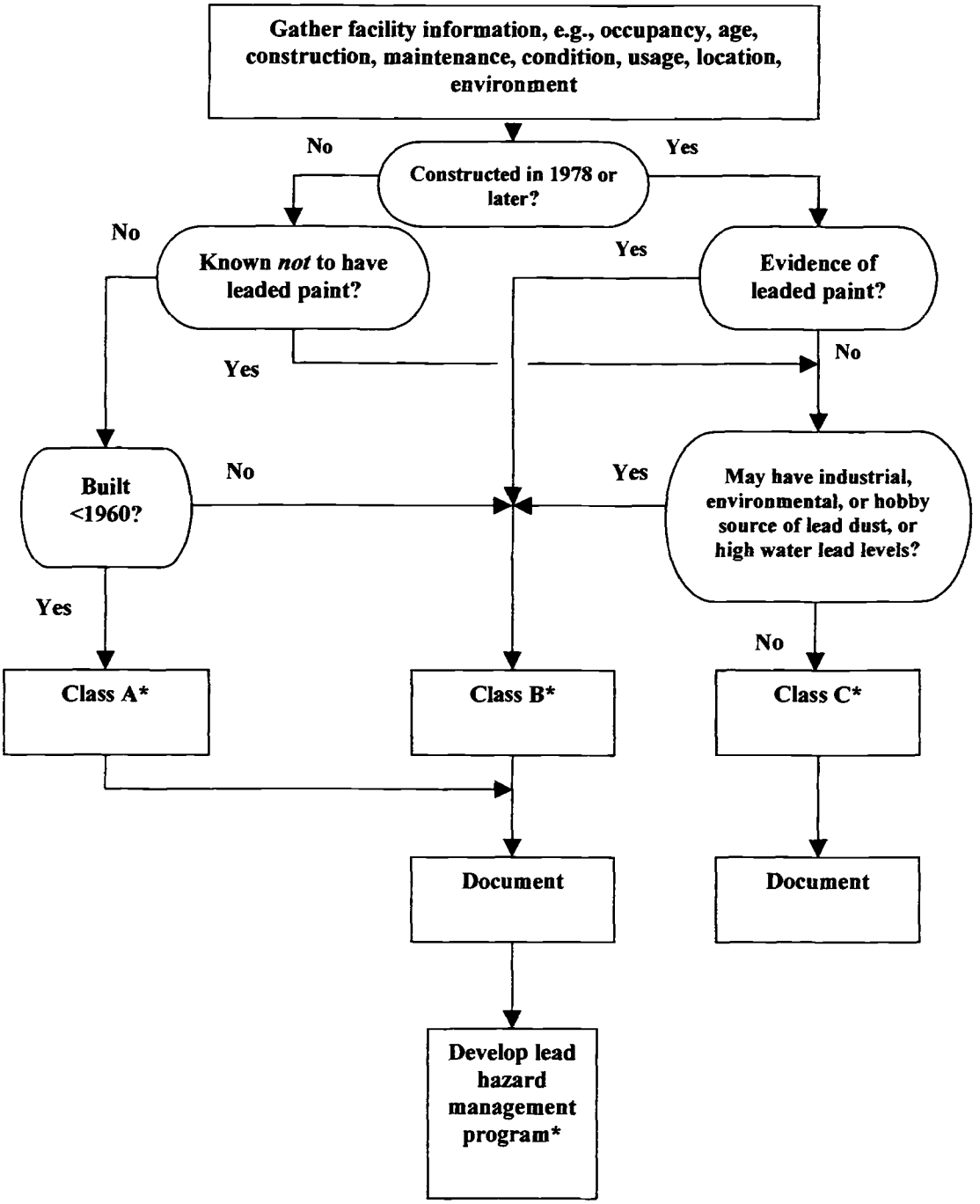
On the north side of town, the 10 buildings that underwent abatement are classified Class C. The rationale for this is all the lead-based paint was removed, even though the buildings were constructed in the 1950s. The remaining 10 buildings are designated Class A. This designation was based on the pre-1960 construction date and the reasonable conclusion that the lead-based paint abated from the similar structures renovated in the late 1980s still exists in the unrenovated buildings.

5.9.2 Private apartment complex with 4 buildings and 36 units

In this example a privately owned apartment complex with four buildings and 36 units total was determined to have been constructed in 1974-1975. One of the buildings is vacant with plans for extensive remodeling during the next 3 months. A review of available documentation failed to indicate any other suspected source of lead.

In this example the owner has hired a consultant knowledgeable of lead hazards in buildings to manage any lead hazards. The consultant placed the four buildings in Class B, but created a special Class B1 for the building scheduled for renovation. This building will be evaluated first for lead hazards that may be present and affect the renovation workers. The results of the evaluation will be used to choose any necessary control measures designed to protect future occupants. The remaining buildings are in Class B2.

Figure 5.4: Procedure for the Classification of Facilities



* Class A facilities tend to have broader and more stringent lead hazard management plans and programs than do those in Class B, because of Class B facilities' generally fewer potential or actual lead hazards, and the generally lower risk when they do occur.

CHAPTER 6: LEAD HAZARD EVALUATION

[This chapter corresponds to ASTM E 2052, section 7]

6.1 Purpose of Lead Hazard Evaluations

The purpose of lead hazard evaluations is to determine the nature and extent of the lead hazard problem that exists within a facility, and to identify current lead hazards and the potential current and future sources of lead hazards.

E 2052 sets out a decision-making framework to assist program managers in deciding when and how to perform lead hazard evaluations. Figure 6.1 is a flowchart that leads the program manager through this process. E 2052 emphasizes risk assessment as the standard lead hazard evaluation method. Lead-based paint inspections and leaded paint characterizations are then performed when required for regulatory compliance, or when this information is actually needed. The lead hazard evaluation provides the data to support decisions regarding implementation of the lead hazard management plan. It also provides the data necessary to select and prioritize lead hazard control methods.

In general, lead hazard evaluations are performed in Class A buildings first, then Class B. However, buildings with an elevated blood lead level child are always the highest priority. Further, buildings occupied by children under the age of 6, or a woman known to be pregnant, are the next priority. This applies to both Class A and Class B buildings. This prioritizing method is further described in section 6.2 of this chapter.

6.1.1 Current and future sources of lead hazards.

ASTM E 2052 defines a lead hazard as a condition that may cause exposure to lead that may result in adverse health effects. This includes levels that exceed limits established by federal, state, or local agencies having jurisdiction. Conditions include deteriorating lead paint, lead-contaminated bare soil, and lead-contaminated dust on surfaces such as floors, window sills, and window troughs. Lead hazards may also result from the release of leaded paint on surfaces subject to friction or impact. Furthermore, lead-related environmental, occupational, and safety hazards, and water containing lead at concentrations exceeding EPA guidelines or applicable regulations would all be considered lead hazard conditions.

The lead hazard evaluation should attempt to identify both current and future sources of lead hazards. Current hazards might include deteriorated leaded paint (any interior or exterior paint that is peeling, chipping, or cracking). This condition poses an immediate hazard for the facility being evaluated. However, leaded paint that is intact would not be considered a current source of a lead hazard. Intact leaded paint that does not release lead to its surrounding environment would be considered a future source of a lead hazard.

6.1.2 Methods of evaluating lead hazards

Lead hazard evaluation methods include lead-based paint inspection, lead risk assessment, and paint characterization. Figure 6.1 provides a decision tree for when to perform which evaluations. Figure 6.2 summarizes the decision-making process when conducting a leaded paint characterization or a paint inspection.

A lead-based paint inspection is a surface-by-surface evaluation to determine the presence of lead-based paint. This surface-by-surface inspection should include all painted surfaces, both interior and exterior. In multifamily buildings all painted surfaces in common areas as well as in dwelling units should be inspected. Portable x-ray fluorescence (XRF) paint analyzers or laboratory analysis of paint samples should be utilized to determine the presence of lead-based paint. At the completion of a lead-based paint inspection, a report should be generated containing the results of the survey.

A lead risk assessment is an onsite investigation of a building to determine the location, severity, and nature of lead-based paint hazards and includes (but, may not be limited to) a visual inspection to determine the condition of painted surfaces, and the need for structural repairs. In addition, sampling locations for dust, soil, and paint sampling are determined. Limited environmental sampling of dust, soil, and deteriorated paint is included as well as a report of the results that identifies acceptable abatement or interim control strategies for controlling any lead-based paint hazards.

Paint characterization is a procedure for determination of the lead content in paint in order to determine whether it is potentially hazardous. The lead content may be determined using a quantitative method such as laboratory analysis. It may also be determined qualitatively or semiquantitatively, that is, by determining whether the lead content is detectable by a qualitative method such as a chemical spot test kit or a semiquantitative method such as portable XRF. However, if

Figure 6.1: Evaluation of Lead Hazards

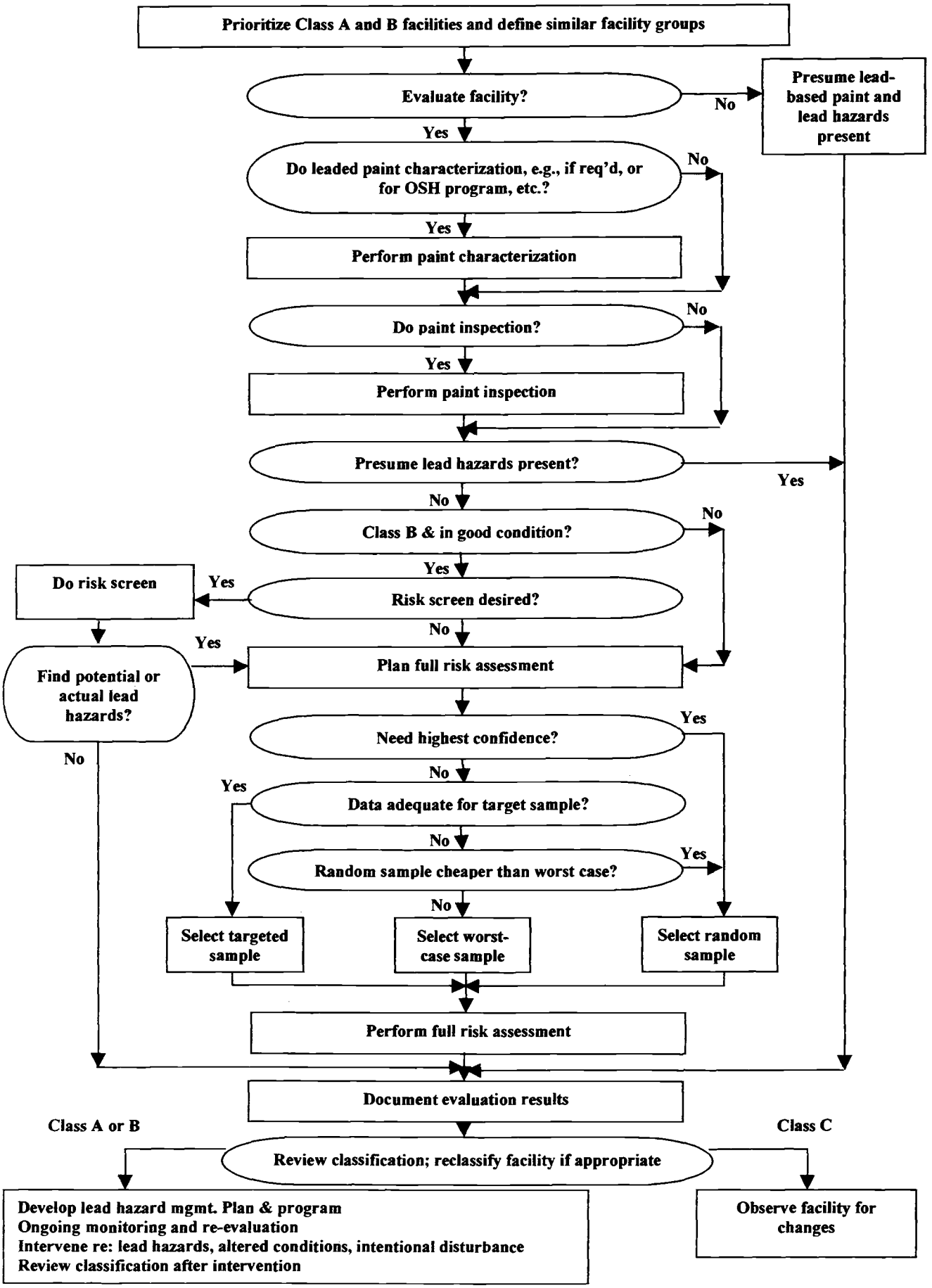
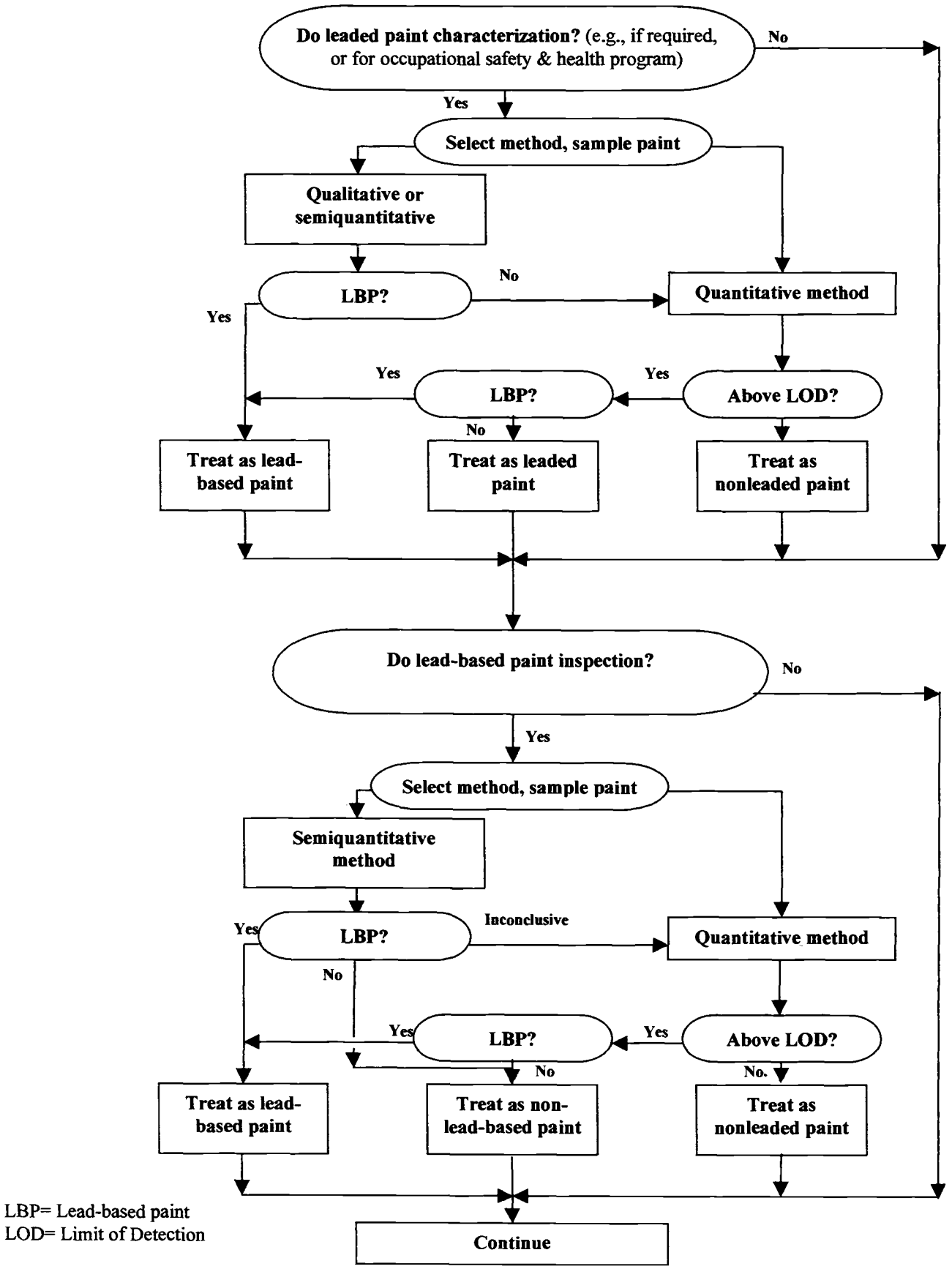


Figure 6.2: Paint Characterization and Inspection



LBP= Lead-based paint
LOD= Limit of Detection

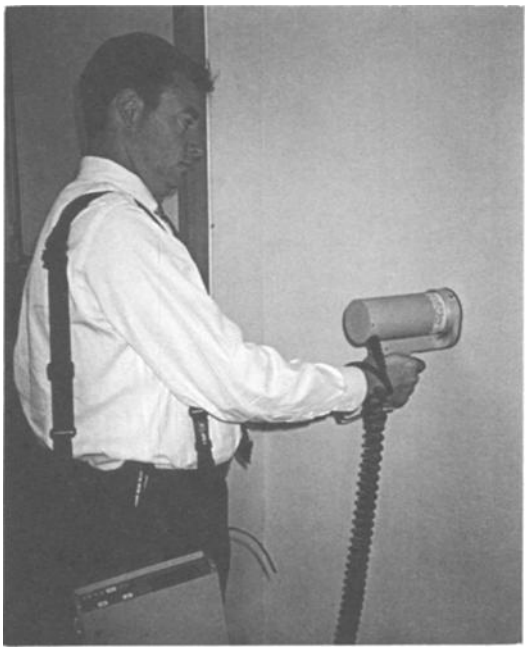


Figure 6.3: Photograph of X-ray Fluorescence (XRF) Paint Analyzer Being Used

the result using the semiquantitative or qualitative method is "negative", quantitative analysis must be performed on the paint being characterized to determine if it is detectable.

The difference between leaded paint characterization using semiquantitative methods such as an XRF and a lead-based paint inspection is that, in characterization, "negative" results are followed by quantitative analysis and "inconclusive" results are treated as "positive".

6.1.3 Purpose and role of the evaluation in the lead hazard management program

The lead hazard evaluation is used to identify current lead hazards and the potential current and future sources of lead hazards. The lead hazard evaluation supports the decision-making involved in implementing the lead hazard management program. It is also used for the selection and application of lead hazard control methods. The data collected during the lead hazard evaluation serves as the basis for these decisions regarding lead hazard control methods.

6.1.4 Requirements under regulations to conduct lead hazard evaluation

In September 1999, HUD published the final rule covering the "Requirements for Notification, Evaluation and Reduction of Lead-Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance." All provisions of this final rule become effective September 15, 2000, except certain prohibited paint removal methods which became efeective on November 15, 1999. Owners of any child-occupied housing built prior to 1978 should review this regulation to determine its applicability to their facilities. It is designated 24 CFR 35. A copy of the regulation may be downloaded from HUD at http://www.hud.gov/lea/leahome.html, along with interpretive guidance and a summary of the rule's requirements.

6.2 Setting Priorities for Conducting Lead Hazard Evaluations

In order to ensure that lead hazard evaluations are conducted in a manner to address those facilities with the greatest potential for lead hazards, the following criteria are set forth to assist in prioritizing these facilities.

6.2.1 Elevated Blood Lead Level (EBL) cases (highest priority)

A facility in which a child with an environmental intervention blood lead level has been detected requires an immediate response independent of any classification system. **It takes priority over all other facilities.** Response to EBL cases should be done in accordance with Section 13 of ASTM E 2052. Chapter 15 of this handbook further explains how to handle Elevated Blood Lead Level cases and the role played by the lead hazard control manager.

6.2.2 Child-occupied facilities

Give the first priority to facilities currently occupied, or planning to be occupied, by children under six, or a woman known to be pregnant. This applies to both Class A and Class B facilities

6.2.3 Class A priority over Class B

Among facilities currently occupied, or planned to be occupied, by children under six, or a woman known to be pregnant, give priority to facilities designated as Class A over Class B facilities.

6.2.4 Other criteria for priority setting

Further prioritize conducting lead hazard evaluations according to the following factors. If the lead hazard program manager has created sub-classifications (e.g., A1, A2, etc.), these sub-classifications may be used to further prioritize lead hazard evaluations.

6.2.4.1 Date of construction

The older the building the greater the presumed risk of it containing leaded paint, or other lead hazards. The earlier the building's construction date the higher the priority for lead hazard evaluation.

6.2.4.2 Physical condition of facility

A facility that is in poor physical condition would take priority over one in good physical condition. If a facility were dilapidated and more susceptible to the development of lead hazards it would take priority over one in better condition.

6.2.4.3 Environmental source of lead contamination

A facility that is near an environmental source of lead contamination would take precedence over one that is not. For example, an industry that may release or has released lead during a manufacturing process would be considered a potential environmental source. Any facilities that would be subject to lead hazard evaluation within the vicinity of such an industry would take priority over those that are not located near an environmental source of lead contamination.

6.2.4.4 Children with EBLs in neighborhood

If a facility is located in a neighborhood where there are children with elevated blood lead levels, perform lead hazard evaluations first in those neighborhoods. Furthermore, a facility located in a neighborhood having ten children with known elevated blood lead levels would take priority over a facility in a neighborhood with five EBL children.

6.2.4.5 Current and future renovation or repair plans

The lead hazard program manager should consider current and future renovation, remodeling, or repair plans. Facilities currently being renovated present an opportunity to perform the lead hazard evaluation without disruption of the occupants. Facilities with renovations planned in the future may effect the schedule for evaluations. If the evaluations can be performed in advance of the renovations, lead hazard control projects could be performed at the time of the renovation, if necessary. This approach could prove to be the most efficient one for some facility owners.

6.2.4.6 Available resources

When prioritizing there may be other factors that will come into play that may not be as cut and dry as those previously discussed.

When discussing available resources the current financial situation must be a consideration. Economic filters can eliminate certain lead hazard evaluation projects from consideration. For example, perhaps a facility has been designated to take priority over a smaller one, but the cost of the lead hazard evaluation for the larger facility is not in the current year's budget. The owner can afford the lead hazard evaluation for the smaller facility. Therefore, the owner, instead of doing nothing, should proceed with the evaluation of the smaller facility, based on the available financial resources.

Other limitations to lead hazard evaluations may be the number of available personnel to conduct them. A larger facility may require a prolonged period of time to perform a complete evaluation; the situation may arise where the professional hired to perform lead hazard evaluations can not provide their services for an extended period. The owner should proceed with the evaluation of the next facility on the priority list that can be completed by the lead hazard evaluation professional within reasonable time constraints.

6.3 Choosing Similar Groups of Buildings for Multiple Evaluation

By using similar groups of buildings for multiple evaluation time is conserved and money is saved. In many cases with similar dwellings a pattern can be determined after inspecting a fraction of the units.

6.3.1 Characteristics of similar facilities

Typically, the units in similar facilities are identified as having a common construction based on written documentation or visual evidence of construction type. They should also be constructed during the same time period.

6.3.2 Selecting representative facilities (or representative rooms in large buildings) from larger groups.

The HUD Guidelines sets forth a method for establishing statistical confidence in dwelling unit sampling.

The number of similar units, similar common areas or exterior sites to be tested (the sample size) is based on the total number of units, similar common areas or exterior sites in the building(s). Table 7.3 of the HUD Guidelines specifies the number of units to be tested based on the total number of units and the construction date of the facility. For facilities constructed prior to 1960 (or are of an unknown age) with 1,040 or more similar units, similar common areas, or exterior sites, test 5.8 percent of them. For 1960-1977 buildings or

developments with 1,000 or more units, test 2.9 percent of the units.

If some tenants refuse access and some allow access, break the housing complex into 2 groups (refusals/allowed) and recalculate the required number of units to evaluate from HUD Guidelines Table 7.3 for accessible units.

The specific units to be tested should be chosen randomly from a list of all units in each building or all buildings. The method for the random determination is outlined below and can be found in Chapter 7 of the HUD Guidelines.

The first step in selecting housing units is to identify buildings in the development with a common construction based on written documentation or visual evidence of construction type. Such buildings can be grouped together for sampling purposes. For example, if two buildings within a development were built at the same time by the same builder and appear to be of similar construction, all of the units in the two buildings can be grouped for sampling purposes. Units can have different sizes, floor plans, and number of bedrooms and still be grouped.

The specific units to be tested should be chosen randomly from a list of all units in each building or buildings. The "Selection of Housing Units" form 7.4 in the HUD Guidelines may be used. A complete list of all units in each group should be used and a separate identifying sequential number must be assigned to each unit. For example, if apartment addresses are shown as 1A, 1B, 2A, 2B, etc., they must be given a sequence number (1, 2, 3, 4, etc.).

Obviously, units without identifiers could not be selected for inspection and would thus bias the sampling scheme. The list of units should be complete and verified by consulting building plans or by a physical inspection of the development.

Specific units to be tested should be selected randomly using the formula below, and a table of random numbers or the random number function on a calculator. Tables of random numbers are often included in standard statistics textbooks. Calculators with a random number function key are easier to use than tables. Inspectors are, therefore, advised to use them to obtain the random numbers, which can then be used to select the specific numbered units. The random number should be between 0 and 1 (e.g., 0.125, 0.638, etc.). A housing unit number is selected by rounding up the product of the random number times the total number of units in the development to the next whole number.

That is:

Housing unit number = random number *times* total number, rounded *up,*

Where:

Housing unit number = the identification number for a housing unit in a list;

Random number = a random number between 0 and 1;

And,

Total number = the total number of housing units in a list of housing units.

The same housing unit may be selected more than once by this procedure. Because each housing unit should be tested only once, duplicate selection should be documented then discarded. The procedure should be continued until an adequate number of housing units have been selected.

The specific common and exterior areas of buildings to test can be determined in much the same way as specific housing units are selected using random numbers.

The number of common areas to test should be taken from Table 7.3 in the HUD Guidelines. In this instance common areas and building exteriors can be treated in the same way as housing units, although they are not to be confused with true housing units.

6.4 Selecting Evaluation Methods

6.4.1 Need to evaluate lead hazards

The selection of an evaluation method depends on the needs that a property owner or manager may want to fulfill. For example, if a painted surface needs to be evaluated to determine the presence of lead before renovation activities a leaded paint characterization might be performed to determine if any lead is present in order to comply with EPA and OSHA regulations. However, other needs for evaluation might require a more thorough approach. If the evaluation will be used to prioritize among facilities a more thorough approach might be necessary such as a lead-based paint inspection or risk assessment.

6.4.2 Regulatory requirements to evaluate lead hazards

Federal regulations currently require the evaluation of lead hazards for certain dwellings receiving federal assistance (see 24 CFR 35). Some state and local regulations may require lead hazard evaluations for some facilities. For all child occupied facilities the current regulations require that persons chosen to perform the lead hazard evaluation are certified pursuant to EPA regulations or similar state regulations. Many

Figure 6.4: Collection of paint sample for laboratory analysis

states have established programs that license these individuals and/or the firms for which they work.

6.4.3 Other reasons to evaluate lead hazards

Other reasons may exist for conducting lead evaluations such as lead in drinking water, environmental sources, arts and crafts activities that may have generated a lead hazard, or the presence of some plastic mini-blinds, among others. These conditions and activities would be strong reasons for conducting lead hazard evaluation.

6.4.4 Presumptions for facilities not (yet) evaluated

6.4.4.1 Lead-based paint presumption

Unless and until lead-based paint inspections or leaded paint characterizations are performed in Class A and B facilities, presume that all paint in them is lead-based paint.

6.4.4.2 Lead contamination presumption.

Unless and until risk screens or lead risk assessments are performed in Class A and B facilities, presume that deteriorated paint is lead-based paint and that all dust and bare soil are lead-contaminated.

6.4.4.3 Refused access presumptions

If a tenant refuses access presume that all paint in the unit is lead-based paint. It should be presumed that all dust and bare soil are lead-contaminated. If some tenants refuse access and some allow access, break the housing complex into 2 groups (refusals/allowed) and recalculate units to evaluate from HUD Guidelines Table 7.3 for the accessible units. The results of these evaluations may be extended to the refused access housing units if the refused access units are of similar construction as those that we evaluated.

6.4.5 Employ standard evaluation techniques

Various evaluation techniques have been developed, tested, and become recognized as standard techniques or methods. The selection, of which standard technique or method is based on several factors, these include regulatory requirements, site-specific information regarding the facility, the purpose of the evaluation, and professional judgment of the person making the selection. As a general rule, techniques required by applicable federal, state, or local regulations should be used first.

6.4.5.1 Regulatory standards

The reader is advised to review applicable federal, state and local regulations to determine if there are required evaluation standards. Particular attention should be paid to the HUD regulations at 24 CFR 35 and the EPA regulations at 40 CFR 745.

6.4.5.2 HUD Guidelines

The HUD Guidelines provide an excellent resource for standard techniques used in the evaluation of lead hazards, such as how to perform a risk assessment or lead-based paint inspection. The Guidelines are also useful in explaining associated techniques such as clearance testing and ongoing monitoring and reevaluation.

6.4.5.3 ASTM standards

ASTM has over 20 standards that deal with lead, many of them detailing techniques for the collection and analysis of lead samples. Some standards that may be useful are listed below. All of these standards and additional ones are available from ASTM.

E 1583
Standard Practice for Evaluating Laboratories Engaged in the Determination of Lead in Paint, Dust, Airborne Particulates, and Soil Taken From and Around Buildings and Related Structures

This practice covers the qualifications, including minimum requirements for personnel and equipment, duties, responsibilities, and services of laboratories engaged in the determination of lead in paint, dust, airborne particulates, and soil taken from and around buildings and related structures.

E 1727
Standard Practice for Field Collection of Soil Samples for Lead Determination by Atomic Spectrometry Techniques

This practice covers the collection of soil samples using coring and scooping methods. Soil samples are collected in a manner that will permit subsequent digestion and determination of lead using laboratory analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Absorption Spectrometry (GFAAS).

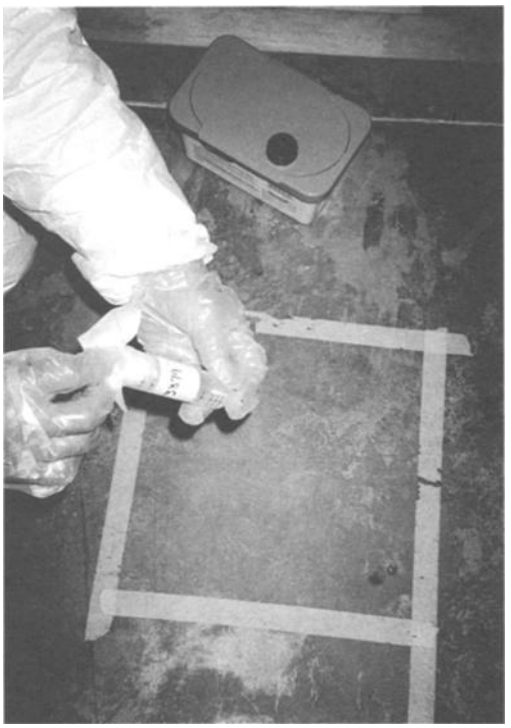


Figure 6.5: Collection of dust by wipe sampling

E 1728
Standard Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques

This practice covers the collection of settled dusts on hard surfaces using the wipe sampling method. These samples are collected in a manner that will permit subsequent digestion and determination of lead using laboratory analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Absorption Spectrometry (GFAAS).

E 1729
Standard Practice for Field Collection of Dried Paint Samples for Lead Determination by Atomic Spectrometry Techniques

This practice covers the collection of dried paint samples or other coatings from buildings and related structures. These samples are collected in a manner that will permit subsequent digestion and determination of lead using laboratory analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Absorption Spectrometry (GFAAS).

E 1753
Standard Practice for the Use of Qualitative Chemical Spot Test Kits for Detection of Lead in Dry Paint Films

This practice covers the use of commercial spot test kits based on either sulfide or rhodizonate for the qualitative determination of the presence of lead in dry paint films. This practice may be used as a qualitative procedure for other dry coating films such as varnishes. In addition, this practice provides a list of the advantages and limitations of chemical spot test kits based on sulfide and rhodizonate to allow user to choose the appropriate spot test for a given circumstance.

E 1973
Standard Practice for Collection of Surface Dust by Air Sampling Pump Vacuum Technique for Subsequent Lead Determination

This practice covers the vacuum collection of surface dusts onto filters using portable, battery-powered, air sampling pumps. Samples collected in this manner allow for the

subsequent digestion and determination of lead content by using atomic spectrometric (or equivalent) methods.

6.5 Leaded Paint Characterization Versus Lead-Based Paint Inspection

The Lead-Based Paint Poisoning Prevention Act defined lead-based paint as 0.5% lead by weight or 1.0 mg/cm^2 lead in dried paint film. The HUD and EPA regulations and guidance documents use this term and definition consistently. Some state and local regulations may use a more stringent definition of lead-based paint. OSHA considers any amount of lead in paint sufficient to trigger certain requirements of the lead in construction standard (29 CFR 1910.1200). The EPA RCRA requirements for leachable metals (e.g., lead) in waste are applicable at lead-in-paint concentrations less than 0.5%. It may also be the policy of some owners or housing authorities to adopt more stringent criteria for lead-in-paint. For these reasons, ASTM has defined another term, leaded paint characterization.

6.5.1 Leaded paint characterization

ASTM E 2052 defines leaded paint characterization as a procedure for the determination of the lead content in paint in order to determine whether it is potentially hazardous. The definition does not specify an exact amount of lead in the paint. An inspector performing a leaded paint characterization may determine the lead content through sampling (i.e., paint chips) and laboratory analysis. This method provides a quantitative result.

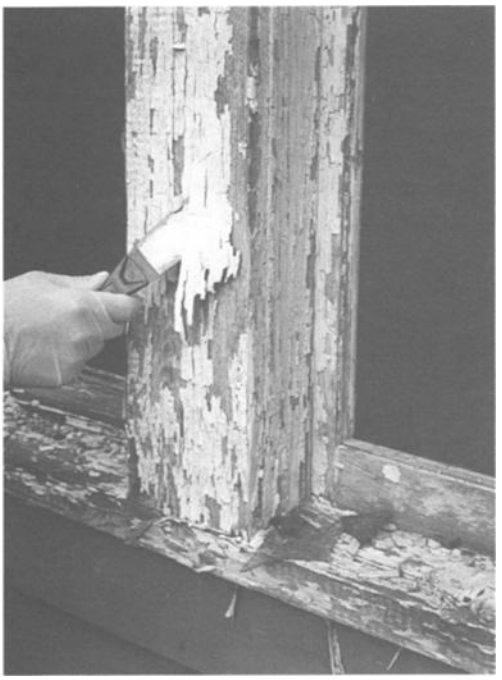


Figure 6.6: Paint chip sample collection

The inspector may also use a qualitative method, such as a chemical spot test kit. The results are reported as either positive or negative for lead, and occasionally, inconclusive. The inspector may also use a semiquantitative method such as X-ray fluorescence (XRF). If the result using a semiquantitative method or a qualitative method are negative or inconclusive, the inspector must perform a quantitative analysis on the paint being characterized to determine if it is detectable.

Example: A project is planned to add an additional handrail to existing metal supports, which are painted. Spot welds will attach the handrail. Recognizing the welding will vaporize any lead in the paint (if present), a leaded paint characterization is performed. A series of paint chips are collected and analyzed by the laboratory. The results show lead in the paint at 0.3%. Based on this information, the OSHA standard applies and special work practices and procedures will need to be followed. If a "lead-based paint" inspection had been performed, the conclusion would have been "not lead-based paint"...and the work may have been performed placing some people at risk.

6.5.2 Lead-based paint inspection

The lead-based paint inspection is a surface-by-surface evaluation to determine the presence of paint having greater than 0.5% lead or 1.0 mg/cm^2 lead in dried paint film. The EPA has established regulations describing how a lead-based paint inspection will be performed in target housing.

6.5.3 Application of ASTM E 2052, Section 18 for sampling and analysis procedures

The sampling and analytical procedures outlined in Section 18 of ASTM E 2052 are intended to ensure that data are of sufficient quality to support decision-making throughout the implementation of the lead hazard management program.

Sampling and analysis for all materials should be performed by qualified laboratories and personnel, in accordance with applicable regulations, ASTM standards, or NIOSH or EPA methods.

Data collection objectives should be established that state why the data is needed, the questions the data will answer, and the decisions that will be made using the data. The level of statistical confidence required should be clearly established in

advance. The data, which will be included in reports as required by regulation or contract, should also be clear.

Plans should be developed for the sampling and analysis required for lead hazard management activities. These plans should be used to avoid the expense of unnecessary repetition due to inadequate quality specifications and to ensure decisions requiring data collection are considered in planning.

The regulatory requirements for sampling and analytical practices and standards should be determined. Appropriate standards and practices for the types of measurements required should be selected to meet data quality objectives. Follow applicable ASTM standards whenever possible. Where other standards and practices are required by regulations, use the more stringent of the individual provisions between the required standard and the corresponding ASTM standard.

The methods to be used for lead sampling are detailed within Section 18 of ASTM E 2052, and reviewed in Chapter 17 of this manual.

6.5.3.1 Qualitative methods

Chemical spot testing is an example of a qualitative method. These methods generally identify surfaces with high levels of lead. When samples collected using a qualitative method give inconclusive or negative results, they can be supplemented by quantitative analysis.

ASTM standard method E 1753, "Standard Practice for the Use of Qualitative Chemical Spot Test Kits for Detection of Lead in Paint Films", describes the method in detail. The uses and limitations of this qualitative technique are also provided.

6.5.3.2 Semi-quantitative methods

Semi-quantitative methods identify surfaces with high levels of lead and in many cases produce data that indicates the amount of lead in the painted surface. However, there are still samples that result in inconclusive or negative results; these samples are supplemented by quantitative analysis. On-site X-ray fluorescence (XRF) is an example of a semi-quantitative method.

6.5.3.3 Quantitative methods

Quantitative methods produce data indicating the amount of lead in a paint sample. Quantitative methods are primarily lab techniques, and include Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), or Graphite Furnace Atomic Absorption Spectrometry (GFAAS). The quantitative methods cited here require samples of the paint to be collected and analyzed. This process will usually take several days or a week, but the results are considered definitive. The qualitative and semiquantitative methods described above provide immediate on-site results, but require sampling for negative or inconclusive results.

6.5.4 Methods to perform lead-based paint inspections

Lead-based paint inspections differ from leaded paint characterization in that they determine if paint films qualify as "lead-based paint". Lead-based paint is defined as having a lead content greater than or equal to 0.5% by weight or 1.0 mg/cm^2 in dried paint film. A negative result in a lead-based paint inspection does not indicate that the surface in question has no lead in its paint film, but that its lead content is less than 0.5% by weight or less than 1.0 mg/cm^2 in dried paint film.

Lead-based paint inspections are conducted using XRF technology or by collecting paint chip samples for laboratory analysis. Paint chip sampling with in-field analysis may also be used. During a lead-based paint inspection using XRF technology the only time a paint chip sample is collected is when an inconclusive result occurs.

6.5.5 Report outline and format

The final report format for single-family housing and multi-family housing is detailed below. It is derived from Chapter 7 of the HUD Guidelines. ASTM is developing a revised report format that should be available in the near future.

The final report for single-family housing must include both a summary and complete information about the site, the inspector, the inspection firm, the inspection process, and the inspection results. The full report should include a complete data set, including:

- Housing unit identifiers;
- Date of the inspection;
- Identity of the inspector and the inspection firm and any relevant certifications or licenses held by the inspector and/or the firm;
- Building component and room equivalent identification or numbering system or sketches;
- All XRF readings (including calibration check readings);
- All paint chip analyses;
- Testing protocol used;
- Instrument manufacturer, model, serial number, mode(s) of operation and age of radioactive source;
- Information on the owner's legal obligation to disclose the inspection results to tenants and/or purchasers before

obligation under 24 CFR part 35 and 40 CFR part 745.; and

- Final classification of all testing combinations into positive or negative categories, including a list of testing combinations, or building component types and their substrates, that were classified, but not individually tested.

The final report should not list inconclusive readings as a third category. If a property owner or manager wishes, they may assume all inconclusive readings are positive. It is not permissible to assume all inconclusive readings are negative. Final classifications are also needed for building component types and their substrates that were not actually tested. For example, if the property owner or manager wants to suspend testing on testing combinations that were found to be positive in the first five room equivalents and are assumed to be positive in the remaining rooms, the final report should list those testing combinations that are assumed to be positive.

The report should also contain a summary that answers these questions:

(1) Is there lead-based paint in the house? *And*
(2) If lead-based paint is present, where is it located?
(3) Although not required, the report should note the condition of painted surfaces and provide recommendations for corrective actions.

The summary report should also include the house address where the inspection was performed, the date(s) of the inspection, the name, address and phone numbers of the inspector and inspection firm, any appropriate license or certification numbers, and the starting and ending times for each day when XRF testing was done, if applicable. The summary should also contain language regarding disclosure, such as:

> " a copy of this summary must be provided to new lessees (tenants) and purchasers of this property under Federal law (24 CFR part 35 and 40 CFR part 745) before they become obligated under a lease or sales contract. The complete report must also be provided to new purchasers and it must be made available to new tenants. Landlords (lessors) and sellers are also required to distribute an educational pamphlet and include standard warning language in their leases or sales contracts to ensure that parents have the information they need to protect their children from lead-based paint hazards."

Although 24 CFR part 35 and 40 CFR part 745 do not require that inspectors and owners keep copies of inspection reports for any specified period of time, future buyers are entitled to all available inspection reports, should the property be re-sold.

If no lead-based paint has been detected in the house, the summary should say so. The following language may be used:

> "The results of this inspection indicate that no lead in amounts greater than or equal to 1.0 mg/cm^2 in paint was found on any building components, using the inspection protocol in Chapter 7 of the *HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* (1997). Therefore, this dwelling qualifies for the exemption in 24 CFR part 35 and 40 CFR part 745 for target housing being leased that is free of lead-based paint, as defined in the rule. However, some painted surfaces may contain levels of lead below 1.0 mg/cm^2, which could create dust or lead-contaminated soil hazards if the paint is turned into dust by abrasion, scraping, or sanding. This report should be kept by the inspector and should also be kept by the owner and all future owners for the life of the dwelling."

The single-family housing forms can be found in HUD Guidelines, Form 7.1. Comparable forms may be used. The method for documentation is identical for multifamily and single-family housing, with the following exception: use Forms 7.2 through 7.6 from the HUD Guidelines for multifamily housing or comparable forms, not the single-family housing forms.

6.6 Lead Hazard Risk Screens versus Lead Hazard Risk Assessments

Risk screens are an on-site evaluation, consisting of visual evaluation and dust testing to identify whether **potential** lead-based paint hazards are present. Lead hazard risk assessments are an on-site evaluation including, but not limited to, visual evaluation and dust and soil testing to determine and report the existence, nature, severity, and location of lead hazards.

A lead hazard screen employs limited sampling and a more sensitive hazard identification criteria. To avoid the costs of a full lead hazard risk assessment, lead hazard risk screens may be performed. The lead hazard risk screen can be performed in facilities in good condition where the probability of finding lead hazards is low.

6.6.1 Lead hazard risk screens for Class B facilities in good condition.

Class B facilities in good condition would be considered the types of facilities that lead hazard risk screens would be performed. These facilities would have the lowest probability of containing lead hazards among all facilities to be surveyed.

6.6.2 Lead hazard risk assessments for Class A facilities and selected Class B facilities.

Lead hazard risk screens should not be used in buildings in poor condition, since a full lead hazard risk assessment will usually be needed. Lead hazard risk assessments determine the presence or absence of lead-based paint hazards and suggest appropriate hazard control measures.

6.6.3 Decision logic for selecting risk screen or full risk assessment.

Figure 6.1 provides ASTM E 2052 decision logic indicating when a full risk assessment should be used in lieu of a risk screen. In general, risk screens are used for Class B facilities which have painted surfaces in good condition.

6.6.4 Facility sampling techniques

Different sampling techniques can be utilized based on the owner's knowledge of the facility in question.

6.6.4.1 Targeted sampling for selecting units for risk assessment or screening

Targeted sampling selects dwellings that are most likely to contain leaded paint hazards to represent the other dwellings based on information supplied by the owner. Risk assessors should obtain the information from the owner's records (if available) or through interviewing the owner. Targeted dwellings should meet as many of the following criteria as possible (criteria are listed in order of importance).

- Dwellings that contain two or more children between the ages of six months and six years. (Preference should be given to dwellings housing the largest number of children).
- Dwellings that serve as day-care facilities.
- Dwellings cited with housing or building code violations within the past year.
- Dwellings that the owner believes are in poor condition.
- Dwellings prepared for reoccupancy within the past three months.

Table 5.6 in the HUD Guidelines describes the number of dwellings that are needed for targeted sampling. Targeted sampling cannot be used for evaluations of fewer than five similar dwellings. When fewer than five similar dwellings are being evaluated, all units should be sampled. If additional dwellings are needed to meet the minimum sampling number specified in Table 5.6, the risk assessor should select them randomly.

If there are a number of dwellings that all meet the same criteria, then the dwellings with the largest number of children under the age of six should be selected. (Children tend to cause increased wear and tear on painted surfaces; therefore, dwellings where children reside are more likely to contain leaded dust hazards.) When possible, at least one of the dwellings should have been recently prepared for reoccupancy, since the repainting and other repairs that are often conducted during vacancy can create a leaded dust hazard. However, the risk assessor should not sample only dwellings that have recently been cleaned and repainted, since this would not accurately represent the conditions that exist in the rest of the dwellings. If there are too many units that all meet the same criteria, the required number should be eliminated randomly.

When determining the number of targeted dwellings, dwellings that are known to currently house children with elevated blood lead levels should be excluded from the total unless there are more than 10 such units, in which case they should be added to the total. However, it must be noted that these environmental investigations require a different procedure, and the risk assessor may need to coordinate their evaluation with the local health authority.

6.6.4.2 Worst-case sampling

Use worst-case sampling if there is inadequate reliable information from the owner to use targeted sampling. Use visual examinations of the condition of the facilities, performed by a risk assessor qualified in accordance with Section 17 of ASTM E 2052, to identify the sites with the greatest probability of having lead hazards. Building condition factors that should be determined are listed in Appendix X1 of ASTM E 2052 and outlined in Table 6.1.

Worst-case sampling is normally more costly than targeted sampling because of the need to do the visual examinations. If the examinations are being performed for other reasons, for example as part of a building maintenance program, the additional cost may not apply.

6.6.4.3 Random sampling

Use random sampling methods if there is inadequate information for targeted sampling, if it is more cost-effective than worst-case sampling, or if a higher degree of confidence in the results is required.

The random sampling method should be used if the owner requires a statistically significant degree of confidence about the existence of lead paint hazards. The method for

Table 6.1: Building Condition Factors

1. Building History:
- Date of construction and historic status.
- Maintenance, alteration and renovation history.
- Known evidence or indication of use of lead containing paint.
- Plans for construction work for reasons other than lead hazard control.

2. Present Condition of Building:
- Condition of paint and substrates:
  - Locations and causes of paint deterioration and damage, and
  - Accumulations of dust and paint debris.
- Water damage or known maintenance problems that could cause water damage: weather, condensation, plumbing leaks and spills.
- Exterior:
  - Condition of roof, chimneys, and flashing around chimneys and stacks,
  - Condition of gutters and downspouts and evidence of leaks from them,
  - Conditions of windows and doors, including caulking,
  - Condition of other exterior components,
  - Evidence of water ponding on horizontal surfaces and inside windows, such as standing water, moss, mildew, or discoloration,
  - Condition of foundation, and
  - Marks or discoloration indicating past flooding.
- Interior:
  - Water marks, discoloration, mildewing, or deterioration of interior surfaces,
  - Deterioration or discoloring of interior window sills and sashes,
  - Condition of caulking around tubs and shower enclosures.
  - Evidence of damaged or leaking plumbing,
  - Lack of bathroom or stove ventilation, or dryer vent, and
  - Evidence of recent maintenance, renovation or repair work that disturbed significant areas of painted surfaces.
- Citations for housing or building code violations within the past year.

3. Occupancy:
- Number of children under six and women known to be pregnant,
- Known degree of care of occupants,
- Usage as day-care facility, and
- Known prevalence of Elevated Blood Lead Level cases in the neighborhood.

4. Other Factors:
- Proximity to potential environmental lead sources,
- Previous or current industrial occupancies or hobbies that may have produced lead contamination (check with health authority),
- Site history, source of soil used for fill, and
- Bare soil, especially with evidence of children's use as play area.

determining the random areas to be tested was previously discussed in Section 6.3.2, and can also be found in Chapter 7 of the HUD Guidelines.

6.6.4.4 Common use areas

Common use areas should be sampled in accordance with 40 CFR 745 and HUD Guidelines, Chapter 5. Chapter 5 of the HUD Guidelines details collection of dust samples from common areas (multifamily housing only) in low-rise and high-rise buildings. The revised Chapter 7 of the HUD Guidelines considers treating common use areas as a separate group and applying random sampling techniques. It is possible, however, that worst-case sampling will prove more efficient.

6.6.5 Consideration of water testing

If notice has been provided by the local water authority that lead levels in tap water exceed the EPA Action Level listed in 40 CFR 141, which is currently 15 parts lead per a billion parts of water, consider testing the water. Test water from wells or private supply wells.

6.7 Interpreting Evaluation Reports and Results

6.7.1 Standard report format for risk assessments

The final report on the risk assessment performed should be presented in a logical fashion and be comprehensive. The HUD Guidelines reporting format has gained wide acceptance and is summarized below. ASTM is preparing a summary guide for reporting results. When available, this document will provide additional information and guidance for the risk assessor.

Part I: Identifying Information

- Risk assessor, name and number of certificate (or license), and state issuing certificate/license.
- Property owner name, address, and phone number.
- Date of report and date of environmental sampling.

Part II: Completed Management, Maintenance, and Environmental Results Forms and Analyses.

- List of location and type of identified lead hazards and summary of optional hazard control methods including an indication of which hazards are priorities. This summary should be suitable for use as notification to residents.
- Management information (optional) (not required for homeowners).
- Maintenance/paint condition information.
- Building condition.
- Brief narrative description of dwelling selection process.
- Analysis of previous XRF testing report (if applicable).
- Deteriorated paint sampling results.
- Dust sampling results.
- Soil sampling results.
- Other sampling results (if applicable).

Part III: Lead Hazard Control Plan

- Acceptable interim control options and estimated cost.
- Acceptable abatement options and associated costs.
- Reevaluation schedule (if applicable).

The information outlined above should be presented to the owner for consideration. The risk assessor should explain the various hazard control options and answer any questions that might arise. Often, with the help of the risk assessor, the owner decides which hazard control option is most appropriate. The final report for the owner should include the following information:

- Interim control/abatement to be implemented in this property (if known by the risk assessor).
- A training plan for managers, maintenance supervisors, and workers (including named individuals), if applicable.
- Method of resident notification of results of risk assessment and lead hazard control program (not applicable for homeowners). Note: this section should include a discussion of how residents are to be educated about lead poisoning, *before* the risk assessment results are released.
- Signature (risk assessor) and date.

Part IV: Appendix

- All laboratory raw data.

If the owner remains undecided about which hazard control measure to use, the risk assessor should state that no hazard controls have been implemented as of the date on the report. Subject to federal and local laws and regulations, a statement of lead-based paint hazard compliance (with an exception date based on the reevaluation schedule) may be provided by the risk assessor (or local enforcement agency) following the successful implementation of the accepted interim control or abatement method(s) and any associated clearance sampling.

The results of the risk assessment should be integrated into the lead hazard management plan. Each risk assessment provides much of the data necessary to prioritize facilities for lead hazard control projects.

6.7.2 Review of evaluation results and reclassification of facilities if necessary.

Once the data has been assembled into a report, the reclassification of facilities may occur. For example, a facility initially classified as Class B found to have no leaded paint hazards may be reclassified as a Class C facility. This is assuming there are no other industrial, environmental, or hobby sources of lead dust.

CHAPTER 7: INITIATING THE LEAD HAZARD MANAGEMENT PLAN

[This chapter corresponds to ASTM E 2052, section 8]

7.1 Overview of Lead Hazard Management Plans and Programs

The three objectives of lead hazard management activities are: 1) to characterize the presence of lead hazards at a facility, 2) develop a facility-specific plan to control and eliminate lead hazards based on these findings, and 3) implement a program based on the plan. The Lead Hazard Management Program is a blueprint for accomplishing these objectives. It can be developed for a single building, many buildings within a facility, or multiple facilities. As a first initiative in establishing a Lead Hazard Management Program, owners are encouraged to develop a policy statement.

The facility owner's policy statement should state the owner's priorities and include goals from which measurable objectives can be developed. The statement should include a commitment to continual improvement and to preventing lead hazards. It should include a commitment to comply with relevant regulations and any other requirements to which the owner subscribes. For example, the latter would include ASTM standards and existing corporate policies. The policy provides the framework for setting and reviewing objectives. The policy must be implemented and communicated to employees, tenants and the public.

Once the policy is prepared, the person responsible for implementing the policy should be designated. That person must also be given the authority to carry out his or her responsibilities. Below is a suggested authorization statement assigning this responsibility and authority.

The program develops, maintains, and uses a written Lead Hazard Management Plan to identify potential pathways for exposure, to identify and implement actions to prevent exposure, and to control lead hazards within a facility. The Lead Hazard Management Plan contains technical and administrative procedures for accomplishing these tasks.

The complexity of the Lead hazard Management Plan will vary with the type and number of facilities that are covered by the Plan and the extent of the lead hazards. There is not a "one size fits all" or "boiler Plate" document that can be used as a Lead Hazard Management Plan in every facility. This can work to the facility owner's advantage by allowing flexibility in developing a customized approach that is the most cost effective and workable for a particular building or group of buildings. Owners and managers should remain aware of any regulatory deadlines that may impact their plans.

In providing guidance on how to develop a Lead Hazard Management Plan for Class A and B facilities, this chapter ties together many of the other topics discussed in this manual. As depicted in Figure 7.1, the development of the Lead Hazard Management Plan begins once the facility has been categorized as Class A or B. Evaluation of the facility for lead hazards prior to the development of the Lead Hazard Management Plan is optional, but it may decrease the time and cost of the effort. Bypassing the lead hazard risk assessment and/or paint inspection is not advisable unless other information indicates there is a strong likelihood that lead hazards are present and the owner has the resources to address all these potential hazards.

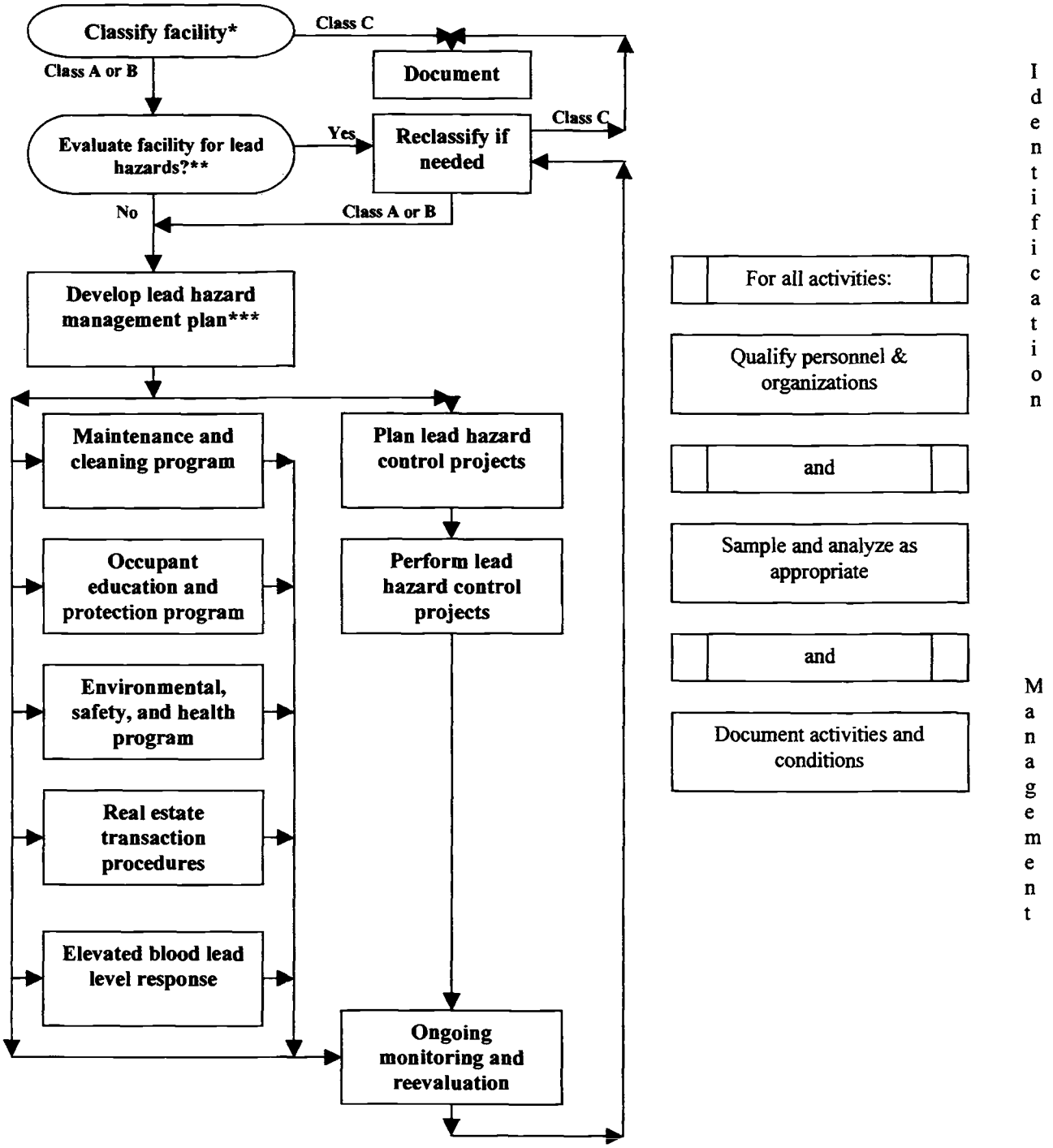
Example of a Lead Hazard Control Manager's Authorization Statement

XYZ Property Management Company is committed to controlling lead-hazards in all its dwellings. _____(name), _____(position or job title), has my authority to direct all activities associated with lead hazard control, including directing training, issuing special work orders, informing residents, responding to cases of children with elevated blood lead levels, correcting lead-based paint hazards on an emergency repair basis, and any other efforts that may be appropriate. The company's plan to control such hazards is detailed in a risk assessment report and a Lead Hazard Management Plan.

(Signed)_____ _____(Date)
(Owner)

(Signed)_____ _____(Date)
Lead Hazard Management Program Manager

Figure 7.1: Lead Hazard Identification and Management Program



* See Chapter 5 and Figure 5.4 for facility classification procedure: In Class A facilities, leaded paint or lead hazards are probable. In Class B, leaded paint or lead hazards are less probable. In Class C, leaded paint and lead hazards are not likely.

** While facilities can be classified without evaluation for the presence, concentration and condition of leaded materials, evaluations generally lower time, costs and liability by helping managers increase confidence in their lead programs and avoid unnecessary control work. Some rules require evaluations of federally owned or –assisted housing at certain times.

*****Class A** facilities tend to have broader and more stringent lead hazard management plans and programs than do those in **Class B**, because of Class B's generally lesser potential or actual presence of lead hazards, and the generally lower degree of risk from those hazards when they occur.

In addition to standard operating procedures for the various components of the Lead Hazard Management Plan shown in Figure 7.1, this chapter discusses issues to consider in developing the Plan, useful resources, and program administration.

7.1.1 Individual facility plans

An individual facility can be a single building or a group of buildings. By definition, a Class A facility will usually require broader and more stringent Lead Hazard Management Plans than a Class B facility that typically has fewer potential or actual lead hazards. A facility consisting of more than one building may have both Class A and Class B buildings, depending on their construction dates. In this case, a single Plan could be written for the facility containing information that was applicable to all buildings (such as administrative procedures) and separate sections that are specific to Class A or Class B buildings (such as lead hazard controls and standard operating procedures).

The management strategy for a facility with a single building will focus on prioritizing areas within the building for lead hazard control measures. A multiple-building facility Plan must also prioritize the buildings, as well as areas within the building, for allocation of resources

7.1.2 Comprehensive management program

For multi-facility owners, a comprehensive approach to lead hazard management will provide the most "bang for the $$". A strategy which considers the allocation of resources and timelines for all Class A and Class B facilities in the building stock will result in controlling or eliminating lead hazards in the quickest and most cost effective manner. This strategy will be influenced by the owner's philosophy toward acceptable levels of health, safety, environmental, financial, and organizational risks.

Some of the practical issues to be considered in developing the strategy are listed below.

- Is there a need to conduct lead hazard evaluations or is it more appropriate to proceed directly to lead hazard control activities?

- If lead hazard evaluation is determined to be appropriate, what type of evaluation should be done in which facilities? Is an inspection to identify the location and concentration of lead in painted and varnished surfaces needed or should a risk assessment to identify lead hazards be performed?

- If the decision is made to forgo lead hazard evaluations, which hazard controls should be implemented in which facilities? (Will interim measures be used or is it more appropriate to eliminate the hazards?)

- What will it cost to evaluate and control lead hazards and how will these activities be financed?

- What is the timeline for conducting lead hazard evaluations and/or implementing hazard control measures? (Facilities will be ranked from first to last for evaluation and/or hazard control.)

The lead hazard management strategy for multiple facilities will need to address three tiers of prioritization. First, a timeline and budget for developing a Lead Hazard Control Plan for each facility must be determined. Next, a timeline and budget for implementing the Plan within each facility must be established. In order to do this, the buildings in each facility and areas within each building will need to be prioritized for lead hazard control activities.

By adopting a strategic, property-wide approach the owner can take advantage of the flexibility that multifamily buildings (and multiproperty portfolios) provide in protecting children from lead hazards. For example, the plan may be structured to allow the relocation of a family with a young child to a hazard-controlled unit to avoid the expense and potential risk involved in protecting occupants and their belongings during hazard control work in an occupied unit.

7.1.3 Establishing priorities for developing and implementing the plans

In developing a Plan which includes several facilities, resources should be appropriated to those facilities which pose the most immediate and serious lead hazards to the most sensitive populations.

The recommended order of prioritization is:

1. Facilities having an occupant with an elevated blood level (EBL) as described in Chapter 15.0.
2. Facilities occupied or visited by children under six or by pregnant women.
3. All remaining Class A facilities
4. All remaining Class B facilities

If further prioritization is needed within Class A and B facilities, it would be advantageous at this point to evaluate the facilities for lead hazards as described in Chapter 6.

Many of the criteria discussed in Chapter 6 for prioritizing lead hazard evaluations can also be used for setting Plan implementation priorities. These include date of construction,

physical condition of the facility, known environmental source(s) of lead contamination, children with elevated blood lead levels in the neighborhood, and current and future renovation or repair plans.

7.1.4 Goal of the Program

The goal of the Lead Hazard Management Program is to ensure that building occupants are provided with facilities free of lead hazards. This can be accomplished by controlling the lead hazards or eliminating them. A lead hazard is defined as a condition that may cause exposure to lead that may result in adverse health effects such as exceeding limits established by the federal, state, or local agency having jurisdiction.

Examples of lead hazards include deteriorated leaded paint, lead-contaminated bare soil, and lead-contaminated dust on such surfaces as floors, window sills, and window troughs. Chapter 2 (Section 2.1) provides a more detailed discussion of lead hazards. It is important to note that the presence of intact lead-based paint in a facility would not be considered a lead hazard. Under a Lead Hazard Management Plan, intact lead-based paint would be maintained and monitored to ensure the condition does not deteriorate into a lead hazard.

7.1.5 Eliminating exposures at identified lead exposure pathways

Eliminating exposures to lead hazards does not necessarily mean that the source must be eliminated. The key is to determine the sources or potential sources of the lead hazard and prevent them from resulting in exposure. The Lead Hazard Management Plan must prescribe the methods that will be used to accomplish this in each facility.

Lead Sources and Pathways Of Primary Concern

Sources	Pathways
Lead-Contaminated Dust on Surfaces	Normal Hand-To-Mouth Activity
Lead-Contaminated Bare Soil	Direct Ingestion
Deteriorated Leaded Paint	Direct Ingestion of Chips
Release of Paint on Friction, Impact, or Accessible Surfaces	Chewing and Ingestion
Water Containing Lead at Harmful Levels	Direct Ingestion

As described later in this chapter, a combination of hazard controls may be used. **For example:** A water-damaged wall in an apartment unit has a 12 square foot area of leaded paint that is flaking and in deteriorated condition. This lead hazard might be addressed by fixing the water leak, removing the deteriorated leaded paint (using proper preparation and removal procedures), priming the surface and applying a topcoat, and then wet cleaning and HEPA vacuuming horizontal surfaces throughout the apartment. This combination of options, known as paint film stabilization and cleaning, would remove the sources and the pathways of the lead hazards without removing all the lead paint in the apartment.

7.2 Obtaining Necessary Resources

There are a variety of resources that provide guidance for developing a Lead Hazard Management Program and the written Lead Hazard Management Plan. The portions of these standards and guidelines that pertain to the components of a Lead Hazard Management Plan are summarized below. Information for obtaining these resources is provided in Chapter 2.

7.2.1 HUD Guidelines (Chapter 3)

ASTM E 2052 is the primary resource for developing and implementing a Lead Hazard Control Program. However, the HUD Guidelines serve as a significant reference tool.

Chapter 3 of the HUD Guidelines titled, "Before You Begin Planning to Control Lead Hazards", is intended to help plan lead hazard control efforts. It describes the process of evaluation and control and discusses items to consider in estimating costs and ensuring quality. The chapter focuses on methods for determining whether risk assessment or inspections are appropriate; the typical phases of lead hazard control projects (both interim control and abatement); and the key issues to be addressed at each phase.

7.2.2 HUD Task Force Report (1995)

Putting the Pieces Together: Controlling Lead Hazards in the Nation's Housing is a comprehensive blueprint for controlling lead-based paint hazards in private housing. It was developed by a 39 member task force representing a wide range of organizations and interests affected by lead-based paint in private housing. The report provides an analysis of the various problems and the current situation, and then discusses 59 recommendations for obtaining solutions. The categories of recommendations include standards of hazard control; implementation, and compliance; public and private financing; liability and insurance; matching units with households; tenant-based (TBA) assistance programs, education strategies; and research needs.

While the recommendations in the report are directed at public and private sector policy makers, there is valuable information

for those who are in the process of developing a comprehensive strategy for controlling lead exposure in facilities. Specifically, Chapter 3, titled "Lead-Based Paint Hazard Control Standards for Rental Housing", provides benchmark standards for lead hazard control in pre-1978 rental housing. These standards are designed not only to eliminate lead hazards, but also to reduce liability and insurance concerns.

7.2.3 HUD regulations

The EPA and HUD jointly promulgated the **Requirements for Disclosure of Known Lead-Based Paint and/or Lead Based Paint Hazards in Housing (24 CFR Part 35 and 40 CFR Part 745**, respectively). As its name implies, this regulation requires any persons selling or leasing housing constructed before 1978 to disclose known lead-based paint/or lead-based paint hazards.

The intent of this regulation is to ensure that families receive both specific information on the housing's lead history and general information on lead exposure prevention. The requirements of this regulation should be incorporated into the Lead Hazard Management plan SOP for Real Estate Transactions discussed in Chapter 14.

The final HUD regulation on lead-based paint hazards in federally owned housing and housing receiving federal assistance published September 15, 1999 should be reviewed to determine its applicability to the subject facilities (24 CFR 35)

7.2.4 EPA regulations

The EPA Requirements for Lead-Based Paint Activities in Target Housing and Child-Occupied Facilities (40 CFR 745) establishes training requirements for individuals that conduct lead-based paint activities (inspectors, risk assessors, designers, supervisors, and workers); establishes standards for training providers; and regulates selected work practices. The EPA regulations also define levels of cleanliness and specifiy requirements for renovations involving lead-based paint. Target housing includes housing built before 1978 (except housing for the elderly and those with disabilities).

The Lead Hazard Management Plan should incorporate the training requirements of this standard into the standard operating procedures (SOPs) for planning and performance of lead hazard control projects, specifically the qualification and selection of consultants and contractors, and the standard operating procedures for ongoing monitoring and evaluation.

The prescriptions for certain work practices should also be incorporated into the standard operating procedures for performance of lead hazard control projects.

The standard additionally requires the development of a written occupant protection plan for all abatement projects. The occupant protection plan must describe the measures and management procedures that will be taken during the abatement to protect the building occupants from exposure to any lead based paint hazards. An accredited supervisor or project designer must develop the site-specific occupant protection plan.

This information should be incorporated into the written Lead Hazard Management Plan SOP for the occupant education and protection program discussed in Chapter 9.

EPA's Identification and Listing of Hazardous Waste regulations (40 CFR 261) affect the disposal of lead-containing waste. The requirements for waste characterization and subsequent disposal should be incorporated into the Lead Hazard Management Plan standard operating procedures for performing lead hazard control projects. (Note: At the time of this publication the EPA was considering a reduction in the requirements for painted architectural components.)

7.2.5 OSHA regulations

OSHA regulates employee exposures in the work place including general industry and construction projects. **The OSHA Lead Exposure in Construction Standard, 29 CFR 1926.62**, applies to all construction work (including alteration, repair, painting, and decorating) where an employee may be occupationally exposed to lead. It is explained in more detail in Chapter 2.

The requirements pertaining to worker protection, air monitoring, engineering controls, housekeeping, hygiene facilities and practices, medical monitoring, and training would apply to in-house staff or contractors who conduct lead hazard control projects. The information in this standard should be incorporated into the Lead Hazard Management Plan standard operating procedures for operations and maintenance; environmental, safety and health programs; and planning and performing lead hazard control projects.

OSHA's General Industry Standard for Lead, 29 CFR 1910.25 applies to routine cleaning and repainting activities where there is little disturbance, wear or corrosion of existing lead-containing paint and coatings or substrates. This regulation might apply to some of the activities included in the standard operating procedures for the operations and maintenance program.

The OSHA Hazard Communication Standards, 29 CFR 1910.1200 for general industry and 29 CFR 1926.59 for construction industry, require employers to inform workers of health risks associated with exposure to hazardous

chemicals in the workplace. This is accomplished through labeling of hazardous chemicals, providing information about the chemicals, and employee training.

These regulations apply to building owners who conduct in-house lead operations and maintenance activities and contract personnel that conduct lead hazard control projects.

There are many other OSHA regulations such as those addressing, fall protection, walking and working surfaces, and scaffolding that might apply to a particular lead hazard control project. For each specific lead hazard control project, the applicability of other OSHA regulations will need to be considered.

7.2.6 State/local regulations

State and local regulations may have more stringent requirements than federal regulations for lead hazard control activities and should be reviewed early in the development of the written Lead Hazard Management Plan. Examples of issues that might be addressed at the state and local level are certification and licensing requirements for those who perform evaluation and control of lead hazards, notification requirements prior to conducting lead hazard control activities, work practices, and waste disposal requirements.

7.2.7 NIBS documents

NIBS has developed two guidance documents which provide useful information for the development of a written Lead Hazard Management Plan. The contents of both are described in more detail in Chapter 2.

Lead-Based Paint Operation and Maintenance Work Practice Manual for Homes and Buildings provides guidance for developing lead-based paint operations and maintenance programs. This resource would be helpful for developing the standard operating procedures for operations and maintenance to be included in the written Lead Hazard Management Plan.

The Manual provides work practices for everyday operations and maintenance activities that may disturb lead-based paint. It is primarily targeted to owners of single family residences and small (3 or 4 unit) apartment buildings who do their own work; and owners and managers of multi-family residential or public and commercial buildings where work is performed by in-house staff or outside contractors.

Guide Specifications for Reducing Lead-Based Paint Hazards provides technical guidance to owners or their representative agents, for the purchase of services for reducing lead-based paint hazards. This resource contains information that would be useful in selecting control methods and developing standard operating procedures for planning and performing lead hazard control projects.

7.2.8 ASTM methods/guidance

As described in Chapter 2, ASTM has a variety of consensus standards and guides that apply to various facets of lead hazard evaluation, identification and control. **E 2052: Standard Guide for Evaluation, Management, and Control of Lead Hazards in Facilities** is the subject of this manual. This guide provides direction for the planning, execution and evaluation of lead hazard management activities and lead hazard control work in facilities occupied or visited by children under six or by pregnant women. It provides an organized approach to using applicable ASTM and other standards and is directed toward owners, property managers, and others responsible for maintaining properties.

Section 8 of the E 2052, discussed in this chapter, provides the framework for developing a lead hazard management program. Its primary focus is the development of a written Lead Hazard Management Plan.

The many other ASTM standards that apply to identifying, evaluating, and controlling lead hazards are summarized in Chapter 2.

7.2.9 Other guidance

Additional information is available from standards, guidance documents, pamphlets, newsletters, and web sites discussed in Chapter 2.

7.3 Preparing a Written Lead Hazard Management Plan

The Lead Hazard Management Document is a working document that will need to be updated on a routine basis. An example table of contents with the key elements of a Lead Hazard Management Plan is provided in Table 7.1. The organization and complexity of the Plan will vary depending on the preferences of the user and the extent of the lead hazards to be addressed.

7.3.1 Identification of known or presumed lead hazards and pathways of exposure

This section of the Plan should describe the lead hazards that have been identified by an evaluation or are presumed to exist in each facility. It should also discuss the pathways for exposure. This information should be provided in enough detail so that a correlation can be made between the lead hazards and the control options that are selected.

If the property owner decides to proceed without the benefit of a risk assessment or paint inspection, a worst case scenario must be assumed in selecting lead hazard controls – i.e. lead-based paint is present on surfaces, there is lead contaminated dust on floors and other horizontal surfaces, and all bare soil is contaminated.

If a risk assessment has been performed, the subsequent report will identify the existence, nature, severity, source and location of lead hazards in related to paint, dust, and soil, or documentation that no lead-based paint hazards were identified. Risk assessments do not usually include the examination of water for lead.

A lead-based paint inspection will provide information about the location of lead-based paint, but will not identify lead hazards. Also, inspections do not typically include the evaluation of dust or soil for lead contamination. A building owner relying on this information would need to include all lead-based paint coated surfaces in the lead hazard control management plan and assume a worse case scenario with regard to lead hazards.

The results of risk assessment reports or leaded paint inspections should be summarized and referenced. Any other information being relied upon should also be referenced. For example, if a visual inspection conducted in an apartment building found deteriorated paint on interior surfaces, the person who conducted the inspection and the documentation, if it exists, should be referenced.

7.3.2 Preventive measures

As is the case with many problems, the most effective method of controlling lead hazards is to prevent them from occurring, or at least to address them as soon as possible once they occur.

Preventive measures for lead hazards include routine building maintenance to prevent water intrusion or moisture problems; routine maintenance of substrates (keeping intact lead-based paint intact); periodic visual assessment to check the integrity of coated surfaces; and education of occupants and maintenance personnel on the proper maintenance, cleaning, and surface protection requirement to prevent lead exposure form occurring. Periodic wet cleaning of surfaces may also be used as a preventive measure.

The Plan should delineate the preventive measures that are to be used in each facility or area of the facility, when and by whom they will be conducted, and what form of documentation will be used to record completion of these tasks.

Table 7.1 Example Table of Contents
Lead Hazard Management Plan

1. Goals and Purpose
2. Administration of Plan
   - A. Designation of Lead Hazard Management Plan Administrator and Delineation of Duties
   - B. Roles and Responsibilities of In-House Staff
   - C. Roles and Responsibilities of Contract Personnel
   - D. Training Requirements
3. Applicable Regulatory Requirements, Guidelines, and Contacts
4. Listing of All Facilities Included in the Plan
5. Listing of all Identified and Presumed Lead Hazards and Pathways of Lead Exposure by Facility
6. Actions to Prevent Exposure
7. Control Methods for Lead Hazards
8. Priority of Implementing Control Methods
9. Standard Operating Procedures

   Each SOP must identify financial resources; provide goals, measurable objectives and a schedule for completion; and describe the procedure for regularly reviewing and updating the SOP.

   - A. Evaluating Lead Hazards
   - B. Occupant Education and Protection
   - C. Environmental, Safety and Health Programs
   - D. Maintenance and Cleaning
   - E. Real Estate Transaction Procedures
   - F. Responding to Elevated Blood Lead Level (EBL) Cases
   - G. Planning Lead Hazard Control Projects
   - H. Performing Lead Hazard Control Projects
   - I. Ongoing Monitoring and Reevaluation
   - J. Qualification of Personnel and Organizations
   - K. Sampling and Analysis

Even for those Class A and B facilities that don't have existing lead hazards, a Lead Hazard Management Plan including preventive measures should be developed. This will reduce the occurrence of lead hazards in the future and provide a means of recognizing and expediently controlling the hazards if they do occur.

7.3.3 Selection of control methods

For a given condition, there are a variety of hazard control responses available. Two criteria that must be met are the protection of human health and the environment and compliance with regulatory requirements. As long as these objectives are met, the building owner can apply economic or other filters in selecting control methods. In other words, the

owner has the flexibility in selecting control methods that are the most cost effective and convenient with respect to short-term and long-term plans for the facility.

7.3.4 Priority of implementing control methods

Once the appropriate control methods have been determined for controlling lead hazards in a facility, they will need to be prioritized. Generally, the lead hazards that are posing the greatest risk to the most susceptible populations (children six years of age and pregnant women) should be addressed first. Other factors to be considered in prioritizing lead hazard control activities are discussed in Chapter 11.

7.3.5 Regulatory requirements

Federal, state and local regulations that apply to any of the lead hazard management activities (i.e. evaluation, control, and documentation) should be summarized and referenced in the plan. It would also be useful to include contact information for the agency and individual (if feasible) that is responsible for enforcement or can assist with interpretation of the regulation. The regulatory requirements should also be incorporated into applicable sections of the written Plan.

7.3.6 Role of staff and contractors/consultants

The first consideration in assigning roles and responsibilities for those responsible for implementing the Lead Hazard Management Program is the combination of in-house and contract personnel that will be used. This decision will be dictated by the philosophy of the owner and/or management company, the extent of the lead hazards and amount of time required to address them, staff size and capabilities, and cost versus benefit considerations. The evaluation of these issues is tied to an understanding of the job descriptions and qualifications for personnel who perform lead management and control activities which are discussed in Chapter 4. It should be remembered that the implementation of the Lead Hazard Management Program is a dynamic process. The roles and assigned responsibilities can be changed as necessary.

Owner and/or property management philosophy – Some owners/property managers consider their liabilities to be reduced by contracting out all safety and health related services, including asbestos or lead operations and maintenance activities. Others feel less liability is incurred by retaining direct control over these activities by using in-house staff. Some property management firms do not want to be distracted from traditional property management responsibilities by "ancillary" duties and prefer to contract safety and health services for this reason.

Extent of lead hazards – If the establishment of a long-term, comprehensive Lead Hazard Management Program for multiple facilities is necessary, management may determine that using in-house staff and hiring additional personnel would be the most cost effective approach. If most of the lead hazard management activities can be accomplished over a relatively short period of time, management may choose to relay on contract personnel to perform most of the activities. In this instance, management might elect to assign and train an in-house Lead Hazard Program Manager and train selected staff to conduct operations and maintenance activities. Contract personnel would be hired to provide evaluation, design, and monitoring services and to perform the lead hazard control projects.

Number and Capability of In-House Personnel – A common pitfall in addressing safety and health concerns in general is to assign this task to someone who already has a full list of responsibilities. Collateral duties may not receive the necessary level of attention simply because there is not enough time in the work week.

Another problem in effective management is the assignment of a collateral duty, such as Lead Hazard Program Administrator, without including the accomplishment of this task as part of the job performance review. The importance management places on the implementation of the program will be observed by those with assigned tasks.

If at all possible, management should avoid assignment of a lead-related task to someone who has no interest or desire in doing it or learning how to do it. The staff person's dedication, experience in building operations, capability, thoroughness, and commitment will play a large role in successful implementation of the Lead Hazard Management Program. Also, the assignment of a Program task to someone who has a competing task should be avoided. For example, a person responsible for maintaining a high level of occupancy in an apartment building who is also responsible for scheduling lead hazard control projects in vacant apartments may consider this to be a conflict in interest.

The decision on whom will perform which functions should be documented in each of the Lead Hazard Management Plan standard operating procedures. For those functions that will be performed by contractor personnel, someone on staff must be assigned the responsibility of ensuring contractor performance.

7.3.7 Financial resources available, including grants and loans

For planning purposes, it may be useful to categorize the costs associated with the implementation of a Lead Hazard Management Program into two categories - those associated with the development, administration and operations and maintenance practices of the program; and those associated with hazard control projects.

Loans or grants for lead hazard control from State or local housing and/or health departments may be available for some properties. HUD's Lead-Based Paint Hazard Reduction Program has made grants to more than 50 state and local governments to evaluate and control lead-based paint hazards. Some states provide financing for lead-based paint hazard evaluation and control through appropriated funds and tax credits. Financing in the way of private loans may be obtained if the property and the lead hazard control project meet the requirements for home improvement or other equity-backed loans (first and second mortgages). These types of loans are more easily obtained if the project involves substantial capital improvements that will increase the value of the property.

7.3.8 Standard operating procedures (SOPs)

At a minimum, the standard operating procedures should describe how to perform specific tasks required by the Lead Hazard Management Plan and how to document that they have been performed. Depending on the extent of the lead hazards covered by the written Lead Hazard Management Plan, all or a combination of the following SOPs will be developed for each facility and included in the written Plan. Guidance for developing each of these SOPs is included in subsequent chapters of this handbook.

- Evaluating lead hazards
- Occupant education and protection
- Environmental, safety, and health programs
- Maintenance and cleaning
- Real estate transaction procedures
- Responding to elevated blood level (EBL) cases
- Planning lead hazard control projects
- Performing lead hazard control projects
- Ongoing Monitoring and reevaluation
- Qualification of personnel and organizations
- Sampling and analysis, and
- Documentation

In addition to detailed procedures for performing the subject tasks, each SOP should:

- Identify the personnel, organizations, and financial resources required and assign specific responsibilities.
- Establish goals with desired objectives and provide a schedule for their completion.
- Contain a procedure for periodic review and update of the SOP to incorporate new information such as changes in personnel, organization or resources; new or revised regulations; and new technology.

7.4 Administration of Plan

The Lead Hazard Control Plan should contain a section on administration logistics. This will include designation of personnel and defining responsibilities; provisions for updating the Plan; and strategies for meeting the goals and objectives of the plan (i.e. establishing time lines, obtaining funding, training, and compliance assurance procedures).

7.4.1 Selecting a lead hazard control program manager

Considerations for selecting a Lead Hazard Management Program manager and the appropriate qualifications for this individual are discussed in Chapter 4 and 7.3.6 of this Chapter. The written Plan should conspicuously include the name, title and contact number(s) for the designated Lead Hazard Management Program manager. A description of the manager's responsibilities and authority should also be provided.

7.4.2 Assign personnel or obtain contractors/consultants to perform required tasks/roles

The written Plan should identify by name, title, and affiliation the persons who are responsible for conducting lead hazard control activities and a description of their assigned duties. This information can be included in the appropriate standard operating procedures and/or in the administration section of the Plan. It is important that this information is current and any changes in personnel should be immediately reflected in the Plan.

7.4.3 Develop time lines to meet goals

Timelines and schedules for meeting the established timelines are valuable tools for the implementation of the Lead Hazard Management Program. Once the facilities and the hazard control projects within the facilities have been prioritized, timelines for conducting the various activities can be set. Cost estimates for the projected lead hazard control activities and available financial resources will also be important factors in setting timelines.

To the extent feasible, a timeline should be developed for each activity included in the written Plan. The activities to be conducted earlier in the program will have a more detailed schedule and the later activities will be more tightly defined as the plan is updated.

For example, a facility may have a five-year plan for addressing all the lead hazards in Class A and Class B buildings. A broad timeline should be developed to indicate

the program activities to be accomplished during each quarter of each year. A detailed schedule would then be developed for activities to be conducted right away such as training of personnel and operations and maintenance activities.

High priority lead hazard control projects planned in the near term or those that will be coordinated with planned renovation activities should also be scheduled with assigned deadlines for selection of consultants, completion of design specifications, selection of contractors, occupant notification, project start-up, project completion, and re-occupancy.

Detailed schedules for longer-term lead hazard control activities that extend beyond the annual budget cycle would be deferred.

7.4.4 Secure financial support necessary to implement the Plan

Determining and securing financial resources will likely be interactive with prioritizing hazard control projects. One approach may be to estimate costs on an annual and five-year basis for implementation of the Lead Hazard Management Program. Then research avenues for assistance through loans, grants, or tax credits. Available funding from outside sources may play a role in prioritizing which projects will be completed first. The portion that must come out of the owner's pocket can then be incorporated into the long-term budget process.

7.4.5 Conduct or obtain necessary training and expertise

A discussion of the recommended and required training and expertise for personnel who carry out various tasks/roles of the Lead Hazard Management Program is provided in Chapter 4. The written Plan should delineate the training and accreditations what will be required for persons performing each of the functions. Requirements for refresher training should also be included. Training should be conducted for all personnel, including the Lead Hazard Management Program administrator prior to initiating cleaning, operations and maintenance, or any of the other lead hazard control activities.

7.4.6 Set-up lead hazard control program compliance assurance procedures

Compliance procedures are the means for ensuring that lead hazard control activities set forth in the written Plan are carried out. The Lead Hazard Management Control Plan should include compliance procedures for activities performed by the in-house staff and contract personnel. Methods for assuring compliance include collection and review of documentation pertaining to lead hazard control activities and direct observation of these activities as they are being conducted.

Collection and review of appropriate documentation – Chapter 16 discusses the development of a standard operating procedure for obtaining and managing the appropriate records relating to lead hazard control activities. As part of the compliance assurance effort, periodic program audits involving the review of these records should be conducted at least annually. Checklists could be constructed to aid the Program administrator or designated representative in auditing various facets of the Program such as operations and maintenance activities, lead hazard control projects, ongoing monitoring and reassessment, elevated blood level investigations, and real estate transactions.
For example, documentation for a lead-based paint removal project should be reviewed for tenant notification, training certificates and/or licenses for project personnel, written project specifications, sampling and analytical records, clearance reports, and waste management records. The documentation should be evaluated for compliance with the requirements outlined in the standard operating procedures of the written Plan. The audit report should note any non-compliance issues and recommend corrective actions.

Early in the establishment of the Lead Hazard Management Program, audits may be done more frequently, particularly when new personnel are involved with a particular activity.

Observation of lead hazard control activities – Direct observation of lead hazard control activities is another means of assuring compliance. These observations can be announced or unannounced. For example, the written compliance procedures might require periodic observation of lead operations and maintenance activities conducted by in-house or contract personnel to determine if standard operating procedures were being followed. A checklist would be developed as the tool for conducting the observations. The checklist would be completed by the Program administrator or designated representative. Any deficiencies or improper procedures would be noted for corrective action.

7.4.7 Designate qualified personnel to revise SOPs on an annual basis as needed.

After Program implementation is underway the personnel involved in carrying out lead hazard control activities will find ways to improve the standard operating procedures. Also, over time there will be changes in personnel or operating conditions that need to be incorporated into the standard operating procedures.

The Lead Hazard Management Plan should designate the personnel responsible for reviewing and updating the SOPs and the frequency for conducting this activity. Typically, this will be done on an annual basis. During the initial stages of

implementation or if there is a change in personnel, it may be necessary to modify the SOPs more frequently.

The persons assigned to review and update the SOPs should have a thorough knowledge of the Lead Hazard Management Program, building operations, and the technical aspects associated with the various lead hazard control activities.

CHAPTER 8: OPERATIONS AND MAINTENANCE (O&M) PROGRAM

[This chapter corresponds to ASTM E 2052, section 9]

8.1 Minimizing and Controlling Lead Hazards Through O&M Activities

The lead operations and maintenance (O&M) program consists of maintenance and cleaning procedures intended to minimize the generation of lead hazards and to effectively remove lead-contaminated dust and soil that has been brought inside buildings.

8.1.1 Establishing an O&M program applicable to all class A and B facilities

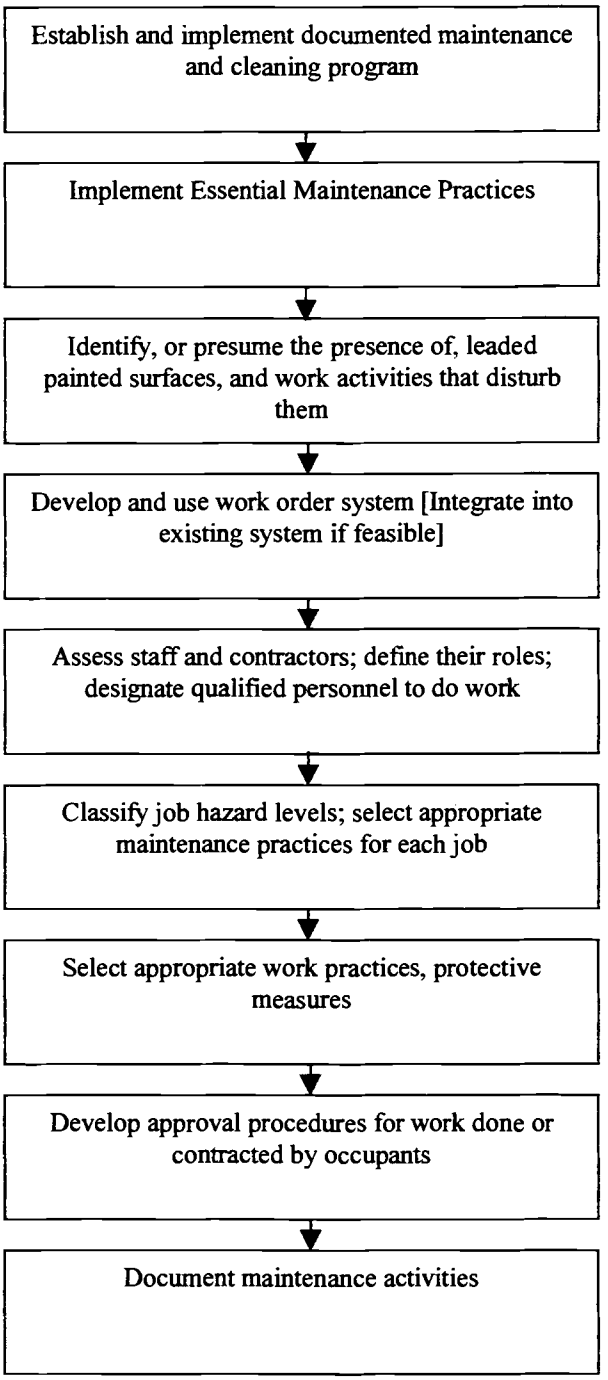
An O&M program should be established for all Class A and Class B facilities. In general Class A facilities include those buildings constructed before 1960, and Class B includes buildings before 1978. Exceptions to this rule and the facility classification scheme are described in Chapter 5. Class A facilities generally will require broader and more stringent programs than Class B facilities since Class B facilities generally have fewer potential or actual lead hazards, which are generally of lower risk when they do occur. The basic elements of the lead O&M program are outlined in Figure 8.1.

8.1.2 Incorporate O&M program into overall lead hazard management program.

The O&M program should be a part of the overall lead hazard management program for a facility. The O&M program remains in force until all lead hazards are eliminated. The complexity of the O&M program will vary depending on the known or presumed lead hazards and sources of lead associated with the specific facility. The program should be in writing with periodic reviews and revisions to reflect the changing lead status of the facility.

The first step in preparing the lead O&M program is to establish a policy and select an O&M program manager. In a small facility the O&M program manager may be the same person as the program manager. In larger facilities the O&M program manager will usually be someone in building maintenance. The additional duties may require the addition of staff or reducing the workload of the person selected. If applicable, selection of the person responsible for an existing

Figure 8.1: Maintenance and Cleaning



asbestos O&M program is a good choice since many of the procedures are similar.

There is not a single widely accepted written lead O&M program applicable to all facilities. There are however many regulations and guidance documents available to assist the program manager. An example written lead O&M program outline is provided below as a starting point. The remainder of this chapter provides additional guidance to assist in completing the program.

Lead O&M Program Outline

- Policy Statement and Summary
- Program Administration and Resources
- Known or Presumed Lead Hazard Sources
- Periodic Visual Inspections
  - Systematic repair of damaged paint
- Maintenance Practices
  - Designated personnel
  - Personnel training
  - Worker protection and equipment
  - Work order system
  - Work practices
  - Prohibited activities
- Cleaning Practices
- Occupant/Tenant Relations
- Recordkeeping

8.1.3 Applicable OSHA regulations for lead O&M work.

The OSHA general industry standard for lead (29 CFR 1910.1025) and the OSHA lead in construction standard (29 CFR 1926.62) are applicable to lead O&M programs. These standards have specific requirements for employee training, exposure monitoring, medical surveillance of employees, work practices, and recordkeeping. The written O&M program should be prepared to document compliance with these regulations, the O&M program manager should be aware the OSHA standards were not written to protect infants and children against lead hazards.

OSHA has not established a level of lead in a particular source (i.e., paint) that triggers compliance with their lead regulations. Lead in paint, detectable in any amount, subject to a maintenance activity triggers the standard(s). The O&M program manager needs to understand that any paint found to contain lead must be monitored during work practices to meet OSHA compliance.

In addition to the OSHA lead standards, other OSHA standards may be triggered by lead hazards. Those most commonly triggered include the hazard communication standard and the respiratory protection standard. The hazard communication standard requires employees be adequately informed about hazardous chemicals/materials they work with. Required employee training and access to material safety data sheets are among the provisions. The respiratory protection standard requires a written respirator program, training and fit testing among its provisions.

Depending on the specific facility and O&M work activities, other OSHA standards common to employee safety and health will apply. It is important for facility management to understand that a lead O&M program does not create new regulatory burdens, but rather provides a means to comply with regulations already applicable.

In addition to these OSHA requirements, the EPA has regulations requiring notification of building occupants prior to certain renovation activities (see 40 CFR 745.85)

8.1.4 O&M work activities are not lead abatement projects.

Lead O&M activities are limited to small-scale projects relevant to the general operation and maintenance of the facility. To the extent these activities help control lead hazards within or around the facility is an added benefit. The O&M program is not a method of abatement.

Chapter 17 of the HUD Guidelines demonstrates the importance of protective measures and the amount of dust that can be generated even from a small-scale project. Using HUD's minimum regulatory limit ($1 mg/cm^2$) for lead in paint, the amount of dust generated from 1 square foot can exceed 900,000 μg. Compared to the HUD clearance sample for floors ($100 \mu g/ft^2$), the amount of dust is significant. The same formula can be applied to a small-scale project. Once it is seen how much dust can be generated from even a small job, the importance of enforcing the work practices and other controls are evident.

8.1.5 O&M work practice levels

In developing a lead O&M program it is necessary to prepare standard work practices for maintenance activities that may disturb leaded paint, leaded components, or lead contaminated dust/soil. For each type of work, the degree of control necessary to minimize the generation of lead dust, and protect the occupants and workers should be determined. The HUD Guidelines have divided common maintenance tasks into "high risk" and "low risk" projects.

High risk projects generally involve disturbance of greater than 2 square feet of lead-based paint per room. Examples of high risk projects include repainting a room where surface

preparation (i.e., scraping or sanding) is involved, plastering or wall repair, carpet replacement, and welding on painted surfaces. Low risk examples include replacing a windowpane, general groundskeeping, and repairing a door. A summary of protective measures suggested for low risk and high-risk jobs is provided in chapter 17 of the HUD Guidelines.

The NIBS *Lead-Based Paint Operations and Maintenance Work Practices for Homes and Buildings* divides lead O&M work activities into 3 levels. Level 1 work practices are followed where only a negligible amount of lead-contaminated dust will be generated. Level 2 work practices are followed for work activities likely to generate a moderate amount of lead-contaminated dust and debris. Level 3 work practices involve full-scale work area containment and worker protection since significant quantities of lead-contaminated dust and debris are likely to be generated.

For some larger maintenance jobs a pilot project may be appropriate. A pilot project is performed to determine the effectiveness of controls used to minimize lead exposure. It also is a test to determine the effectiveness of the maintenance activity.

8.2 Essential Maintenance Practices of ASTM PS 61

ASTM Provisional Standard 61, *Provisional Guide for Prevention and Control of Lead-Based Paint Hazards in Rental Housing*, describes the "essential maintenance practices" for property owners. These essential maintenance practices are found in the HUD Task Force Report and should be incorporated into any lead O&M program. The six essential maintenance practices are listed below and described in greater detail in this chapter.

1. Use sample work practices during work that disturbs paint that may contain lead to avoid creating lead hazards.
2. Perform visual examination for deteriorating paint at unit turnover and every 12 months.
3. Promptly and safely repair deteriorated paint and the cause of the deterioration.
4. Provide generic lead-based paint hazard information to tenants in accordance with current regulations.
5. Post written notices to tenants asking them to report deteriorating paint and informing them whom to contact.
6. Train maintenance staff.

8.2.1 Reduce lead hazards through good work practices, specialized cleaning and control of work sites

Safe work practices are methods that control or prevent the release of lead dust, prevent the tracking of lead hazards from one place to another, and include special cleaning practices. This cleaning helps prevent the spread of lead dust and keeps the amount of dust that can become airborne to a minimum. Good personal hygiene practices will also prevent the spread of lead dust, plus it will help protect the employee from unnecessary lead exposure.

For some types of work, control of lead dust can be achieved by using specially designed tools. These are tools fitted with HEPA filtered dust extraction equipment. The use of power sanding and sand blasting should not be permitted to remove lead-based paint unless equipped with a HEPA filtered local exhaust.

Open flame burning and water blasting for removal of lead-based paint should not be used. Dry scraping of only small areas of paint (e.g., less than one square foot per room) is permitted when necessary. Painted surfaces should be wetted before disturbance and any debris generated wetted before sweeping. Alternatively, a HEPA filtered vacuum should be used to collect dry paint dust and debris.

Good work practices also include the use of plastic coverings to protect surfaces, furniture and occupant belongings not moved out of the maintenance work area. The degree of covering depends on the size of the project.

Once the work is completed specialized cleaning of the work area is performed to remove lead-contaminated dust. For most maintenance projects wet cleaning of surfaces with a cleaning agent is effective.

The work area should be controlled in a manner that only allows authorized personnel entry into the area. This is normally achieved by barriers and signs placed at the entrances to the work area. Authorized entry should be restricted to trained employees.

8.2.2 Periodic visual inspections for deteriorated paint

Periodic visual examinations for deteriorating paint should be performed at unit turnover and every 12 months, unless the tenant refuses entry. It should also occur promptly after receipt of notice from a tenant or occupant of deteriorating or damaged paint.

The inspection should start with a review of the last inspection to determine a base line for the proposed inspection. The route of the visual inspection should then be mapped out to avoid missing any areas. This is best done using a plan of the building. If there are no plans of the building a sketch or fire emergency plan of the building can be used to verify the inspection of each location.

The inspector should identify the following items in the inspection:

- Deteriorated painted surfaces
- Dust accumulation
- Impact or surfaces that are subject to friction
- Chewable surfaces

(a) Deteriorated painted surfaces

To maintain conformity of the inspections painted surfaces are broken down into categories. These categories are:

- surface deterioration-chalking, mildew, worn paint
- bulk deterioration-checking, cracking and flaking, alligatoring
- layered deterioration-blistering, peeling

The inspection should determine these conditions and make recommendations as to their control or abatement.

(b) Dust accumulation

If accumulations of dust are observed during the inspection samples of the dust should be taken to verify the presence or absence of lead. Accumulations of dust usually point to poor housekeeping. In these situations inspections should be scheduled more frequently. The inspector should also try to determine the source of the dust. If dust is only accumulating in one area what's causing it? It may be chalking paint, paint dust from friction surfaces, or dust from outside influences.

(c) Impact or surfaces that are subject to friction

Special attention must be paid to impact surfaces and friction surfaces. These conditions are often brought about by weather conditions. During damp or high humidity conditions a door or window may stick or rub. Each window/door should be inspected for these conditions. Windows that don't open easily or doors that bind before opening normally show signs of the condition on the painted surface. The paint is worn away or is scuffed and rough to the touch.

(d) Chewable surfaces

Chewable surfaces are surfaces that a child can bite. This includes surfaces or fixtures five feet or less from the floor or ground that form a protruding corner or similar edge, or protrudes one-half inch or more from a flat surface. The inspector should look for signs of chewing, teeth marks or localized splintered wood as common signs.

8.2.3 Systematic repair of damaged paint

The systematic repair of damaged paint is called "Paint Film Stabilization". This is a process of wet scraping, priming, and repainting surfaces that are coated with deteriorated lead-based paint. Before attempting to perform paint film stabilization, the cause of the deterioration must be determined. If the condition that caused the paint to fail is still present it must be corrected.

The surface is prepared by wet scraping the affected area. Mechanical sanders without HEPA vacuum attachments should not be used for this type of surface preparation. If a heat gun is used, it must be used carefully, and not permitted to scorch the painted surface. These tools can cause high

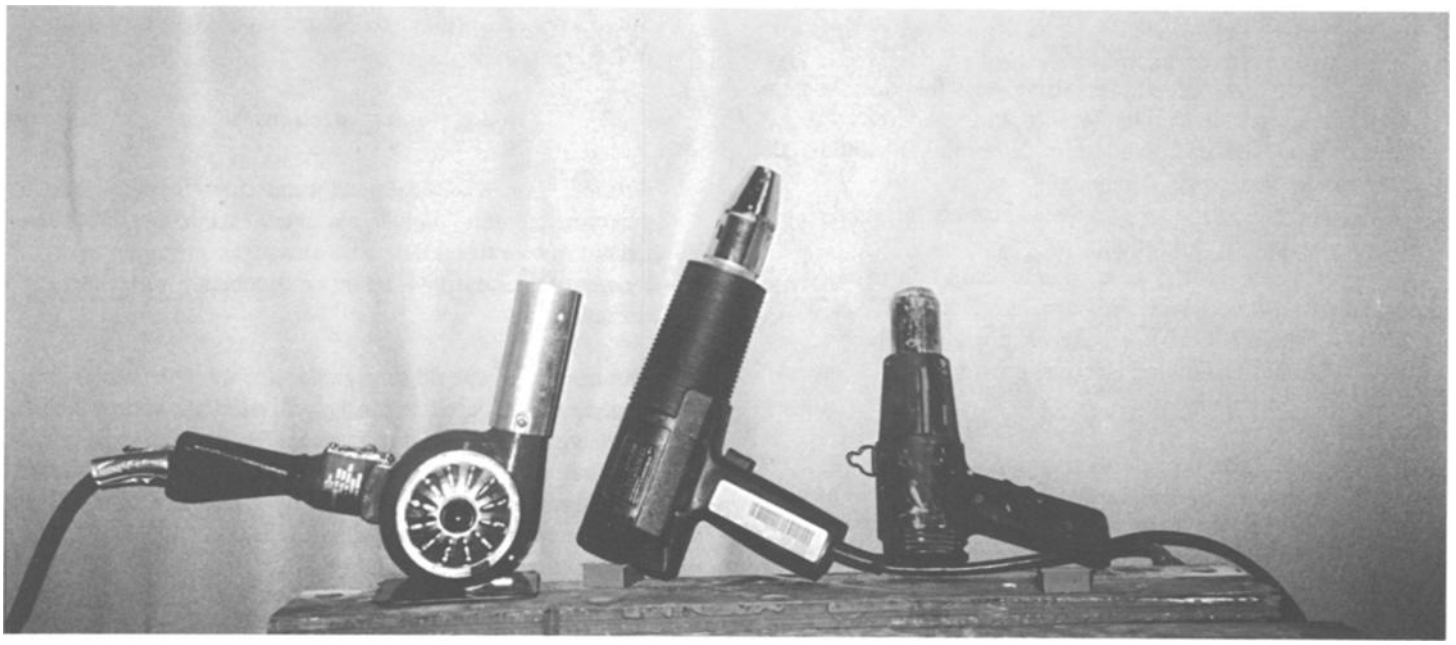


Figure 8.2: Heat guns must be used with extreme care

concentrations of fumes and lead dust to be released. Once the deteriorated surface is prepared the adjacent areas are deglossed. The surface is now ready for priming. The manufacturers drying period should be observed before applying the top coat of paint. Only good quality primer and top coats should be used for paint film stabilization. Lastly, the new paint must be compatible (will adhere) to the old existing paint. This information can be easily obtained from the paint supplier, if necessary.

8.2.4 Training procedures for maintenance staff

Maintenance personnel that may work with lead-based paint, clean-up lead-contaminated dust and soil, and perform other limited work with lead must receive basic training. This training should include information on lead hazards, safe work practices, containment methods, and specialized cleaning practices. The training should include facility specific information regarding the lead hazard management program, and the location of known or presumed lead sources. The maintenance staff should also be knowledgeable of the occupant education and protection provisions of the program. Depending on the extent of the work allowed to be performed by the maintenance staff, additional training may be required to comply with federal OSHA and EPA regulations, and state or local regulations applicable to the facility.

OSHA requires training of all employees whose exposure to lead exceeds the action level for more than one day. The training curriculum is defined by the regulation and is required to be repeated annually. At a minimum the maintenance training should include:

- the content of the lead standard (29 CFR 1926.62)
- the nature of the work involving the employee's exposure to lead
- the selection and limitations of respiratory protection
- the health effects of lead exposure
- the medical surveillance program
- the medical removal program
- the use of engineering controls to reduce airborne lead dust
- the contents of the compliance plan
- the use of chelating agents
- the employee's right of access to medical records, and
- access to all training materials

If actual lead abatement work is to be provided by the maintenance staff in "Target Housing" or "Child Occupied Facilities" then the employees must be trained in accordance with EPA training requirements (40 CFR Part 745 Lead), or similar state or local regulations. This would require that some employees be trained as lead abatement project supervisors. EPA requires that a certified supervisor is onsite during all work site preparation, and during the post abatement clean up. During the abatement activities, the supervisor must be onsite or available by telephone. The supervisor must be able to be present at the worksite within two hours. This training will require workers to attend an EPA or state approved training course for 16 hours and supervisors for 32 hours.

8.2.5 Designated personnel for lead work

From a practical standpoint, each facility should designate specific maintenance personnel to perform lead-related work. The remainder of the maintenance staff should be familiar with what constitutes lead work, and notify their supervisor when it becomes apparent their work activity will disturb leaded paint or other lead components. The supervisor can then have those designated to perform lead work complete any lead-related tasks.

On paper this approach sounds simple. In reality, it is cumbersome to stop projects, find the trained person, and then complete the work. One solution is to institute a work order system or incorporate lead-related projects into an existing work order system.

8.2.6 Set-up project classification system and work order procedure

The lead O&M program manager must understand the difference between "O&M activities" and "abatement activities". In general, the EPA has defined abatement to mean any measures or set of measures designed to permanently eliminate lead-paint hazards. The regulation, at 40 CFR 745.223, explains that abatement does not include renovation, remodeling, landscaping or other activities, when such activities are not designed to permanently eliminate lead-based paint hazards, but, instead are designed to repair, restore, or remodel a given structure or dwelling, even though these activities may incidentally result in a reduction or elimination of lead-based paint hazards. Furthermore, abatement does not include interim controls, operations and maintenance activities, or other measures and activities designed to temporarily, but not permanently, reduce paint hazards.

Abatement projects must be performed by state or EPA certified personnel and comply with all provisions of 40 CFR 745. In general, certified personnel in accordance with 40 CFR 745 must also perform work in response to an elevated blood lead child.

Many, if not most, facility maintenance departments operate on a work order system. The typical work order describes the task to be performed (i.e., replace door knob, repair water heater, repair plaster wall), where the work needs to be done,

and when it should be completed. A question added to the existing work order form can be used to alert the maintenance department to possible lead hazards resulting from the work. "Will this work disturb lead-based paint, lead-contaminated soil, or create lead-contaminated dust?"

The maintenance supervisor should check one box; yes or no. If the answer is "I don't know", the "yes" box should be checked. For some projects it may be necessary to visit the work site to make a determination. Since some maintenance departments already use a system like this for asbestos, it should be easy to implement. All work orders checked "yes" for lead are then assigned to be performed by the designated personnel for lead work. Remember that lead abatement work will need to be performed by certified personnel.

Once designated lead work, the supervisor will need to decide what level of protection will need to be provided to the worker(s), the occupants, and the surfaces in the facility. The HUD Guidelines suggest dividing the work into low risk and high risk projects (see Table 8.1). The NIBS *Operations and Maintenance Work Practice Manual* divides projects into 3 levels. Level 1 generally corresponds to low risk projects in the HUD Guidelines and includes projects where only a negligible amount of lead-contaminated dust may be generated. Levels 2 and 3 define work with increasing amount of lead-contaminated dust generated.

Once the project has been classified a separate work order is prepared by the maintenance supervisor that covers the lead work. This work order specifies the work practices, personal protective equipment, and other requirements specific to lead. Figure 8.3, taken from the HUD Guidelines is useful for facilities with lead-based paint. The NIBS Manual for O&M work also has example work order forms attached as appendices.

8.2.7 Procedures for selection of appropriate work practices

The work practices to be used on a project will again depend on the size of the project and the nature of the work to be accomplished.

The following work practices should be used at a minimum for interior work designated low risk work.

- Occupant relocation usually not necessary, but children are not allowed in the work area.
- The posting of signs must regulate the area. These signs should be at the entrance to the work area. They do not have to be displayed outside the building.
- Set up handwashing facility
- The HVAC system should be turned off and the vents sealed with polyethylene. If the vents are more than five feet away from where the work is to be performed they do not have to be covered with polyethylene.
- Polyethylene sheeting is used to cover the floor area directly below the work. The polyethylene should extend about 5 feet in all directions. There is no need to cover doors or entranceways with polyethylene.
- The five feet area around the work should be cleared of furniture that can be moved. If the furniture cannot be moved then it must be covered with polyethylene and sealed.
- Place all tools and equipment at the work site
- Perform the work, using wet methods, except near electrical outlets.
- Wet wash all surfaces within the five feet work area including polyethylene sheeting and 2 feet beyond.
- Visually check the area for cleanliness

For high risk work, the following work practices are usually followed for interior projects.

- Regulate the area by posting signs
- Set up handwashing/hygiene facility
- Turn off the HVAC system. Tag the switch box.
- Seal all air registers with polyethylene
- Remove all furniture from the work area
- Seal with two layers of polyethylene any fixed items or items that cannot be moved from the work area
- Cover the entire floor with two layers of polyethylene
- Install polyethylene airlock flaps on all doors
- Place all tools and equipment in the work area
- Bring in disposal containers
- Perform the work
- HEPA vacuum, wet wash, HEPA vacuum all surfaces within the area
- Perform cleaning cycle on the floors of areas used to access the worksite
- Perform visual inspection and collect dust wipe samples for clearance *(Send samples for analyses)*
- Remove all remaining tools and equipment from the work area
- Remove polyethylene barriers over HVAC vents, doors and remove signs when clearance has been certified by analysis of the dust wipe sample collected.
- Repeat cleaning if dust wipe sample analysis fails clearance criteria.

The following work practices should be used at a minimum for exterior work:

- Regulate the area with caution tape or fencing and signs *(At least twenty feet from where the work is performed)*

Table 8.1: Summary of Low- and High-Risk Job Designations for Surfaces Known or Suspected to Contain Lead-Based Paint

Job Description	Low Risk	High Risk*
Repainting (includes surface preparation)		✓
Plastering or wall repair		✓
Window repair		✓
Window pane or glass replacement only	✓	
Water or moisture damage repair (repainting and plumbing)		✓
Door repair	✓	
Building component replacement		✓
Welding on painted surfaces		✓
Door lock repair or replacement	✓	
Electrical fixture repair	✓	
Floor refinishing		✓
Carpet replacement		✓
Groundskeeping	✓	
Radiator leak repair	✓	
Baluster repair (metal)		✓
Demolition		✓

*High risk jobs typically disturb more than 2 square feet per room. If these jobs disturb less than 2 square feet, then they can be considered low-risk jobs.

Table adapted from Table 17.1 in the "HUD Guidelines for the Evaluation and Control of Lead-Based Paint in Housing", June 1995.

Figure 8.3: A Typical Work Order Form

Leaded Paint Maintenance Work Order Form

Reference to work order number_____

Respirator required?_____Yes_____No

Protective clothing required?_____Yes_____No

Size of plastic sheeting to be placed under work area_____

Cover whole floor with 6-mil plastic sheeting?_____Yes_____No

Cover doorway to room with plastic sheeting and construct airlock?___Yes_____No

Tape door shut?__Yes_____No

Move furniture out of room?_____Yes_____No

Shut down HVAC system?_____Yes_____No

Wet down item to be repaired?____Yes_____No
(CAUTION: Do not wet areas near electrical circuits.)

Relocate occupant?_____Yes_____No

Cleanup:

HEPA vacuum needed?___Yes_____No

Disposal of waste will be done by_____

Visual inspection of cleanup by supervisor:

_____Sufficient _____Repeat Cleaning

Dust sampling required after task is completed?_____Yes_____No

Modifications to work_____

Work assigned by_____

Work completed by_____

Final inspection by_____

Date of completion_____

- Set up handwashing/hygiene facility
- Remove all movable items from work area *(Remove at least twenty feet away)*
- Cover ground under work area with polyethylene sheeting
- Attach edge of ground polyethylene sheeting to building
- The polyethylene sheeting should extend ten feet beyond the perimeter of the working surfaces
- Weight all edges of polyethylene sheeting with two-by-fours
- Cover polyethylene sheeting with wood boards to provide a working surface for ladders and to prevent rupture of the plastic from debris
- Install vertical wind breakers where necessary *(Do not work if wind speeds exceed twenty miles per hour)*
- Ensure that all windows within twenty feet of the work area are closed
- Perform the work
- Maintain housekeeping duties throughout the work
- Remove debris at frequent intervals
- HEPA vacuum all paint debris and dust from polyethylene before picking up the plastic
- Complete clean up must be undertaken each day
- Remove polyethylene drop clothes and wind breakers if used
- Remove all tools and equipment from regulated area

8.2.8 Worker protection procedures and equipment

Personal protective equipment includes protective clothing and respirators. Protective clothing is worn to prevent harmful materials such as lead from coming into contact with the body. In conjunction with respiratory protection equipment, properly selected protective clothing can protect employees who must work in a lead-contaminated environment.

Protective clothing includes coveralls, head covering, foot covering, and gloves. These are necessary for all high risk projects. While not required for most low-risk work, they are often used since the regular work clothes could not be taken home and would have to be laundered separately from other clothing. Disposable coveralls with attached hoods and booties are frequently used.

OSHA requires respirators for all employees that are exposed to lead above 50 $\mu g/m^3$ (permissible exposure limit) for an 8-hour, time-weighted average. Most low risk projects will not exceed this limit if safe work practices are used. However, OSHA requires respirators to be worn until the employer can demonstrate the exposures are below the limit. This includes some specific work practices that may be used for operations and maintenance projects such as manual scraping or sanding of leaded paint.

Figure 8.4: A half face air-purifying respirator is often used

Respirators should always be used for high risk projects. Typically a half face air purifying respirator is used, but some employers provide full face powered air purifying respirators (PAPRs). The PAPR generally provides increased protection and must be provided if requested by an employee for use where respirators are required. Employers are reminded that they must have a respiratory protection program for employees using respirators. This program should comply with the OSHA respiratory protection standard found at 29 CFR 1910.134.

Personal hygiene is often overlooked on maintenance projects, but this failure is one of the significant pathways for lead exposure. Maintenance staff should wash their hands and face immediately after every low risk or high risk project. Showers should be taken after high risk projects. Eating, drinking, smoking, and applying cosmetics should not be permitted in any work area.

8.2.9 Prohibit further use of lead-containing paint

Although lead-containing paint is still available it is hard to obtain. Most lead containing paints must be specially ordered through a paint wholesale company and cost more than regular paint. It should be a written company policy to only use non-lead paint. This written statement can be in the form of a

"sticker" attached to all purchase orders for paint. The policy should be forwarded to each department that is involved with maintenance, remodeling, or new construction. It may be necessary to notify these departments on a regular basis (every three years) of the no lead paint policy.

8.2.10 Restriction on use of plumbing fixtures and solder

Effective June 19, 1988, the U.S. Consumer Product Safety Commission has been enforcing the Federal Hazardous Substances Act's requirement that all solders that contain more than 0.2% lead must be labeled with a warning. Before this time solder normally contained about 50% lead and would be marked on its label "ALLOY 50/50". Federal law prohibits the use in drinking water systems of solder like this.

Solder used in drinking water systems should bear the label "95/TIN, 5/ANT." This is solder made from 95% tin and 5% antimony.

8.2.11 Policy and procedures for drinking water coolers with lead-lined tanks

The Lead Contamination Control Act of 1988 declared water coolers with lead lined tanks to be imminently hazardous consumer products. Manufacturers and importers of these coolers were ordered to repair, replace, or recall them and provide a refund by November 1, 1989. The law also requires that solder, flux, and storage tank interior surfaces in contact with drinking water contain not more than 0.2 percent lead. Other parts of water coolers, which may come into contact with drinking water, may not contain more than 8.0 percent lead.

The EPA has published lists of water coolers by brand name and model designation (see Federal Register, January 18, 1990 notice). If not already completed, the program manager should review the lead status of water coolers manufactured before 1988.

8.2.12 Specialized cleaning practices

Cleaning at the conclusion of a low risk project should consist of wet cleaning with a lead-specific detergent. The cleaning should include the immediate work area plus two feet beyond the plastic drop cloth. Trisodium phosphate (TSP) in water is commonly used, but may not be available in states that prohibit phosphate detergents.

For high risk work, the cleaning protocol is HEPA vacuum, wet wash, HEPA vacuum again. The vacuuming should start at the top of the room furthest away from the entrance, and the work should proceed forward and down toward the entrance. The wet cleaning is then started in the same manner. At the top of the room furthest away from the entrance and all surfaces washed. The wash water should contain a lead-specific cleaner. The wash water and the rinse water should be kept in different buckets. Once the washing of the work area is completed the surfaces must be allowed to dry and the HEPA vacuuming sequence repeated. The surfaces should be cleaned in this manner until no visible dust remains.

The cleaning of carpets should only be done with a HEPA filtered vacuum equipped with a beater bar attachment or similar device. Furniture should be cleaned using the same cleaning protocols; HEPA vacuum, wet wash and HEPA vacuum again. Upholstered furniture should be vacuumed only.

8.3 Selection of work practices

General work practices are described in section 8.2.7 for lead-related operations and maintenance work. The NIBS *Operations and Maintenance Work Practice Manual* provides detailed descriptions of work practices and the sequence of work for many common maintenance tasks involving leaded paint. Where appropriate, these practices should be adopted for use.

Figure 8.5: A HEPA vacuum traps essentially all lead dust

8.4 Management and documentation of lead-related work

8.4.1 Management of in-house work

For any O&M program to be effective there must be a commitment by the building owner, and building management personnel. The program should be formulated so that it becomes a permanent addition to existing custodial and maintenance programs. The program manager is responsible for all projects that involve the disturbance of lead-based paint or other lead materials.

The program should require all projects that disturb lead-based paint, large or small, to have a work order. The program should designate the program manager as the only person to authorize the work. This allows the program manager to reference inspection reports recording the location of lead-based paint and to determine if it will be disturbed by the pending work.

During the course of the work the program manager should monitor the project to determine if the work is being done in compliance with the written instructions.

The program manager should observe:

- that all employees are properly trained
- that all employees have current medical's
- that air monitoring and/or dust wipes are being taken (if necessary)
- that protective clothing and equipment is adequate for the work
- that the correct level of respiratory protection is being used
- that hand washing/shower facilities are available
- containment barriers are in keeping with the level of work being performed
- only authorized personnel are entering the work area

8.4.2 Management of contracted work

The program manager must review all contract work to determine if the work will disturb any lead-based paint or other lead materials. If the work does involve lead-based paint or other lead materials then the same work order system used for in-house work should be implemented.

All contracts for work that will involve the disturbance of lead-based paint or other lead materials must contain specific language outlining the requirements, specialized equipment, and restrictions of the O&M program.

8.4.3 Management of occupant-conducted or occupant-contract work

Intervention by facility management of occupant conducted lead work will be dependent upon the lease agreement and occupant education efforts. If the agreement allows such work to be performed by the occupant without any restrictions then there is little that can be done, other than to provide advice. The Consumer Product Safety Commission warns of the hazards of "do-it-yourself" removal of lead-based paints. They make the statement in CPSC Document #5055, "There is no completely safe method for "do-it-yourself" removal of lead-based paint. Each of the paint-removal methods, sandpaper, scrapers, chemicals, and torches or heat guns can produce lead fumes or dust. Lead-based paint should only be removed by professionals, trained in hazardous materials removal, who follow detailed procedures to control and contain lead dust." It is possible for a complete building to become contaminated from even a relatively small project.

Many lease agreements require the tenant to notify the landlord (building management) before undertaking any alterations or other "improvements". One approach is to strictly enforce this provision and review the work to determine if lead-based paint or other leaded components will be impacted. This work may then be performed by the trained maintenance staff, or by an approved contractor.

8.4.4 Recordkeeping

A copy of the O&M program along with any revisions or updates should become part of the permanent records of the program. Other records to be maintained include the following.

- O&M Program Manager(s)
- Designated maintenance staff
- Training records
- Respirator fit-test records
- Exposure monitoring records
- Medical surveillance records
- Medical removal records, if applicable
- Results of any clearance tests
- Completed work orders
- Waste disposal records

CHAPTER 9: OCCUPANT EDUCATION AND PROTECTION PROGRAM
[This chapter corresponds to ASTM E 2052, section 10]

The occupant education and protection program is intended to reduce the risk of lead exposure to occupants and visitors arising from the facility and other sources. It is also used to encourage the cooperation of occupants in managing lead hazards.

9.1 Evaluating Occupancy Characteristics

By evaluating occupancy characteristics the owner or property manager of a facility can select educational methods and materials that are appropriate to the occupants. In a small facility with only a few tenants, door-to-door distribution of educational materials with a face-to-face meeting may be a more reasonable approach. With a large population of tenants, a series of educational seminars would be more practical. Tenants with children could be invited to meetings that focus on children's exposure to lead and issues specific to children.

9.1.1 Lessor/lessee arrangements with building owner/manager

Owners and property mangers are responsible for educating and protecting occupants and tenants who are themselves lessors of the facilities. Lessors are responsible for educating and protecting lessees in their spaces.

9.1.2 Population of facilities including ages of residents and socioeconomic status of households

Information on resident ages and the socioeconomic status can assist in efficiently transferring information. The education materials utilized must be tailored to reach the target audience. For example, if a large number of occupants are children then a picture or comic book might help them more readily accept the information being disseminated.

9.1.3 Appraisal of occupants' attitudes about risk of lead hazards and confidence in building management

Appraise the attitudes and confidence occupants have in the types and formats of risk communication information provided to them and their attitudes towards building management. Do they recognize lead hazards to be a serious threat or does the information end up in the trash? In addition, if occupants of a facility are distrustful of the building management they may not report deterioration or damage because of the fear of reprisal by building management. Occupants may fear they will be held responsible for the damage and the implied financial burden.

9.1.4 Estimate tenant turnover

The building owner should estimate tenant turnover to more efficiently provide information to new tenants. Each time a new occupant moves in they should be provided with the available information about lead hazards in the facility and how to avoid them.

9.1.5 Considerations of language barriers and occupants' literacy

Childhood lead poisoning disproportionately affects low-income, inner-city neighborhoods and communities of color that are often culturally diverse. Therefore, educational materials need to be culturally and linguistically tailored to reach non-English speakers and people at low literacy levels. Photo novellas that contain few words are a useful tool, as well as materials in a number of commonly spoken languages.

9.2 Determination of Education and Protection Needs

9.2.1 Designation of person responsible for occupant education program

The person who is selected to serve as the point of contact for the occupant education program should be someone known and trusted by the occupants of the facility. This person or persons will be responsible for spreading information and being accessible to occupants when they need to report information about the creation of potential lead hazards. The person selected should receive sufficient training to become knowledgeable of issues related to lead hazards. While this individual need not be an "expert" on the subject, he or she should be capable of answering general questions about lead and specific questions about the lead hazard management program for the facility.

9.2.2 Resources available for occupant education programs

9.2.2.1 Lead hazard management plan

The lead hazard management plan document can be a useful tool for educational purposes. It details the locations of leaded paint hazards and their current status. Priority classifications

for buildings are described as well as control methods employed. It may be impractical to distribute the lead hazard management program to all residents of a facility, but it may be kept on file, for occupants to access, at a central location, such as the point of contact's office.

9.2.2.2 Building specific information

Lead hazard situations may vary on a per building basis. One building might require extensive information on leaded paint hazards, another building information on lead in water, or even another on environmental sources of lead. The point being, occupants of different buildings may face different sources of lead hazards and educational information should be tailored to protect the occupants of that building.

Information can be designed that is building specific. Data can be presented to occupants to inform them of their building's status including locations of lead hazards and their nature; precautions they should take to prevent children from encountering them; and who the point of contact is on lead hazard issues and how to contact that person.

9.2.2.3 Disclosure forms and information pamphlets (note: EPA, HUD, etc.)

Disclose the presence of known lead-based paint and lead hazards to occupants or prospective occupants in accordance with 40 CFR 745 and 24 CFR 35, state or local regulations, or other suitable documents as appropriate for federal property.

Provide existing and prospective occupants with the EPA/HUD/CPSC Information Pamphlet and written notice of the known or possible presence of leaded paint in the areas that they use, including their space and common areas.

The EPA/HUD/CPSC Pamphlet, "Protect Your Family From Lead in Your Home" (Publication No. EPA747-K-94-001, May 1995), provides a summary of key points regarding lead including the following:

- Health effects associated with exposure to lead
- How lead exposure occurs
- How and when to have blood lead tests performed
- Where lead-based paint is found
- Other sources of lead hazards
- Where lead becomes a hazard
- How to check for lead hazards
- What residents can do to reduce the risk of lead hazards
- Lead hazard control measures
- Remodeling or renovating activities
- Where to get more information

9.2.2.4 Health department assistance

It may be difficult to develop suitable educational materials because of the diversity that exists among facility occupants. Health Departments may have information that has already been developed to reach different ages, sexes, languages, education levels, and socioeconomic statuses. Obtain assistance in planning and identifying suitable educational materials from the health department having jurisdiction.

Figure 9.1: Educational documents are available from various government agencies, including HUD and EPA.

9.2.2.5 Lead-in-water test results

Lead-in-water test results should be made available to occupants as part of the occupant education program. If water test results indicate dangerous lead levels, occupants may be instructed on ways to reduce their exposure, such as using cold water for drinking or cooking, since lead is more likely to leach into warm or hot water.

9.2.2.6 Other available guidance and education materials

Any information such as pamphlets from government agencies on lead should be made available to occupants. Phone numbers for local health departments, medical resources, and the designated point of contact may also be made available.

9.2.3 Determine delivery method(s) for information (e.g., video, written)

The choice of delivery method for occupant education materials should be chosen so as to reach the largest number of facility occupants and be understood by the majority of those who receive the information.

Written information is most likely the easiest form to disseminate. Information could be mailed out to occupants or dispersed on a door to door basis. A drawback of written information serving as the delivery method is that there is no guarantee it will be reviewed.

An alternative to written information could be a video on lead hazards. The video could be presented at a community meeting. If attendance is taken, the owner or property manager is aware of who has and who has not received the information. Occupants will have an opportunity to ask questions about the hazards that exist and how they should address them. Video can be designed to also reach those who have lower literacy levels. Written information can also be dispersed at a community meeting.

The choice of delivery method for educational materials is dependent on many factors, but in all cases the decision should be made with the goal of reaching the largest number of the occupants who may be impacted by lead hazards within the facility.

9.3 Preparation of Written Program

The outline of an Occupant Education and Protection Program is provided in Figure 9.2.

9.3.1 Disclosure procedures for new occupants (or existing occupants when implementing a new plan)

New occupants or existing occupants at the implementation of a new lead hazard management plan must receive vital information to ensure the success of the plan. Information should include educational information on lead and the health risks of lead hazards; who the point of contact is and how to reach that person; notification as to lead hazard locations and the effects on children; outlined procedures to access occupant's space for lead hazard management activities; and information about lead in water.

9.3.1.1 Dissemination of educational information

All existing occupants and new occupants should receive educational information developed as a result of the lead hazard management program. The information should disclose the presence of known lead-based paint and lead hazards to existing and prospective occupants. Occupants should be provided with the EPA/HUD/CPSC Information Pamphlet and written notice of the known or possible presence of leaded paint in the areas that they use, including their space and common areas. New and existing occupants should be informed as to whom the point of contact is on lead hazard issues and how to reach that person. Advise occupants of precautions they can take to protect children from lead hazards, including information about potential environmental, occupational, or hobby sources of lead hazards.

9.3.1.2 Establishing a point of contact for occupants

A point of contact should be established for occupants to speak to regarding lead hazards. Someone known and trusted by occupants is the ideal candidate. Inform all occupants who the point of contact is and how they can contact that person.

Provide written notice to occupants that they should inform their point of contact of any plans for work that they intend to perform or have others perform that may disturb painted surfaces (e.g., TV cable installation, painting, electrical work, minor repairs, installation work). Occupants should be informed in writing that they should report deteriorating paint and damaged substrates to their point of contact. Occupants need to be reassured that there is no reason to fear reporting deterioration or damage, there must be no implied repercussions for such actions.

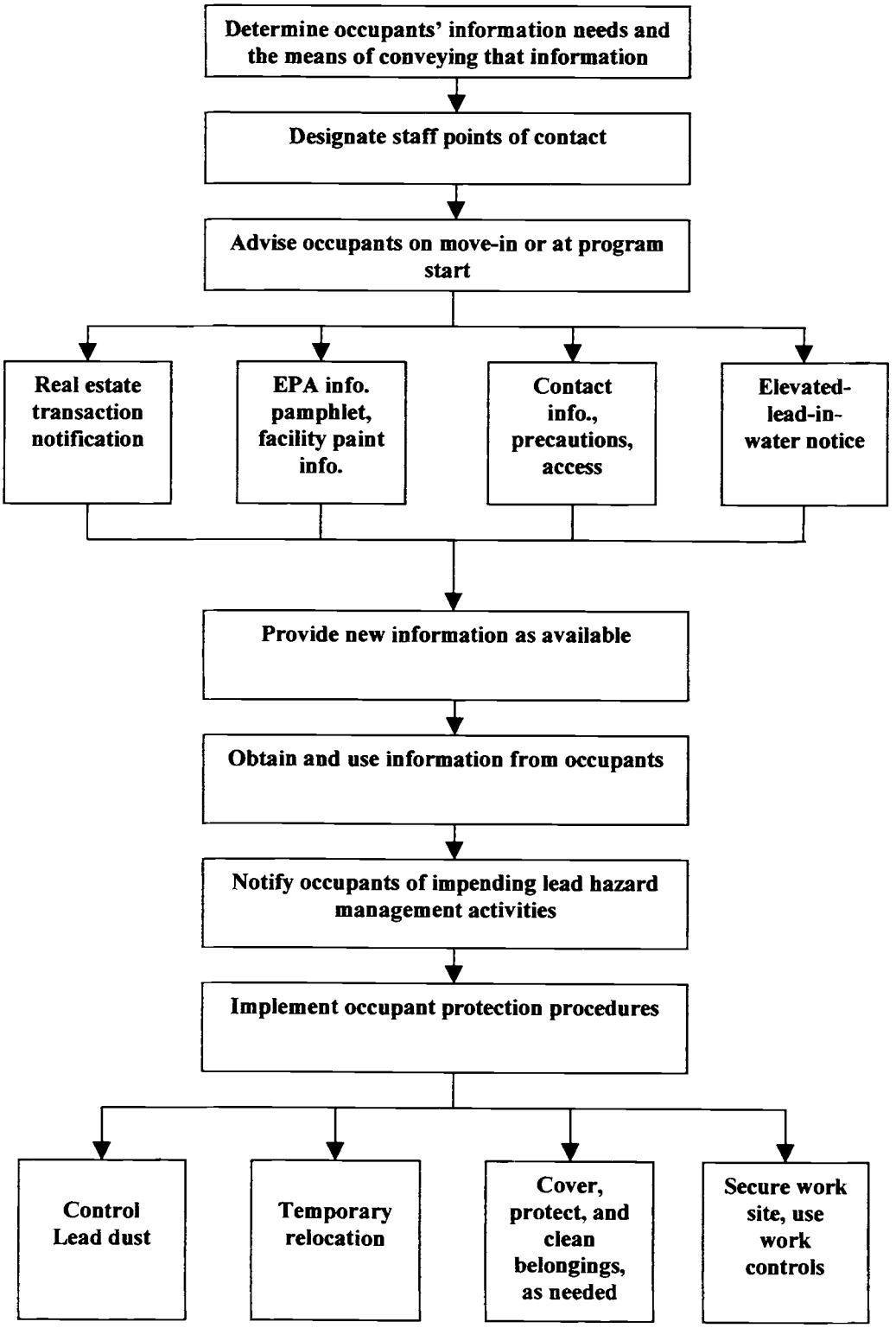
9.3.1.3 Warning to occupants about known or suspected lead hazards to children and others

The locations of all known lead hazards should be disclosed and the health effects that can result from these hazards in children, pregnant women, and others clearly explained.

9.3.1.4 Outline procedures to access occupants' space for lead hazard management activities

Establish standard procedures with tenants to conduct lead hazard management activities. Notify occupants in a timely manner of impending lead hazard management activities and any other work that may create additional lead hazards in compliance with regulations and lease terms. Occupants should be informed as to what the hazards are, how they

Figure 9.2: Occupant Education and Protection Program



should protect themselves, and in addition what the owner will do to protect them. Provide occupants with a copy of the EPA Renovation Pamphlet, "Reducing Lead Hazards When Remodeling Your Home" (Publication No. EPA 747-R-94-002, April 1994).

9.3.1.5 Provide information on lead-in-water per 40 CFR 141

Residents should be notified if the local water authority has provided notice that lead levels in tap water exceed the EPA action level listed in 40 CFR 141. If there has been such a notification, occupants can be informed using the specific language included in the regulation:

"The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that lead is a health concern at certain levels of exposure. There is currently an action level of 15 parts per billion (ppb).

Part of the purpose of this notice is to inform you of the potential adverse health effects of lead. This is being done even though your water may not be in violation of the current standard.

EPA and others are concerned about lead in drinking water. Too much lead in the human body can cause serious damage to the brain, kidneys, nervous system, and red blood cells. The greatest risk, even with short-term exposure, is to young children and pregnant women.

Lead levels in your drinking water are likely to be highest:

- If your home or water system has lead pipes, or
- If your home has copper pipes with lead solder, and
- If the home is less than five years old, or
- If you have soft or acidic water, or
- If water sits in the pipes for several hours."

9.3.2 On-going occupant notice and education

9.3.2.1 Precautions occupants should take to protect themselves

Teaching residents precautionary measures, particularly the children's caregivers, is not in itself sufficient to prevent childhood lead poisoning, but it can assist residents in reducing the risk that their children will be seriously poisoned.

Educational materials may suggest simple preventive measures, such as washing children's hands before eating and after play, and washing toys. Children's nutrition is also important. Foods high in iron and calcium reduce absorption of lead into children's bodies, while fatty foods increase the rate of absorption.

Furthermore, occupants should communicate and cooperate with property owners by providing access to maintenance crews and contractors; notifying property owners promptly of deteriorating paint or conditions that cause such deterioration; performing routine or regular housekeeping to help reduce lead dust levels; avoiding activities that disturb painted surfaces or create dust; and testing children and reporting elevated blood levels to the property owner.

9.3.2.2 Recognition and reporting of deteriorating lead-based paint and other lead hazards

Occupants should be educated and encouraged to recognize and report conditions or activities that may generate lead hazards. Occupants if trained to recognize such conditions or activities may serve as a first line of defense in preventing the development of lead hazards.

9.3.2.3 Reporting by occupant of activities likely to result in lead exposure

Occupants should be notified in writing that they should inform their point of contact of any plans for work that they intend to perform or have others perform that may disturb painted surfaces. Examples of such activities might be TV cable installation, painting, electrical work, minor repairs and installation work.

The facility owner or manager should utilize notifications from occupants of conditions or activities that may generate lead hazards. Occupants should be educated and encouraged to recognize and report such conditions and activities. An occupant notification of a suspected lead hazard should trigger a work order to investigate and correct any problems identified. For this to occur, the occupant notifications of problems should be integrated into the work order system.

9.3.2.4 Reporting to occupants of lead hazard control projects

Occupants should be notified of impending lead hazard management activities and any other work that may create additional lead hazards in compliance with regulations and terms of the lease. Compliance with 40 CFR 745.85 requires delivery of an informational pamphlet to affected parties prior to certain renovations. Occupants should be informed as to what the hazards are, and how they should protect themselves, in addition to telling them what the owner will do to protect them.

9.3.2.5 Complaint resolution procedures without reprisal

Occupants should not fear reprisal from building owners, property managers, or the lead hazard management program point of contact. If residents feel threatened in any manner, they will not report existing or developing lead hazards. This creates a dangerous situation; residents are an integral part of lead hazard prevention.

OCCUPANT EDUCATION SHOULD PROMOTE THESE GOALS

- Communicating and cooperating with property owners by providing access to maintenance crews and contractors;
- Notifying property owners promptly of deteriorating paint or conditions that cause such deterioration;
- Performing routine or regular housekeeping to help reduce lead dust levels;
- Avoiding activities that disturb painted surfaces or generate dust;
- Ensuring good hygiene and nutrition; and
- Testing their children and reporting elevated blood levels to the property owner.

9.3.3 Occupant relocation

As part of the program, facility owners and managers should develop procedures for protecting occupants and their belongings while work that creates lead hazards is in progress, in accordance with HUD Guidelines, Chapter 8. These procedures should be integrated with the contamination control activities.

9.3.3.1 Occupant relocation procedures

When occupants are at risk of being exposed to leaded paint hazards they should be relocated to another dwelling away from the existing hazard or lead hazard management activity that may create one. The LHMP should include a written program detailing the protocol for resident relocation. Residents should be moved to comparable facilities.

Relocation dwellings should be acceptable to residents so that they will not attempt to return to their own dwellings during lead hazard control work. Dwellings that serve as temporary relocation units must be lead safe. In addition, those units should be adequately equipped with furniture, cooking facilities, refrigerators, televisions, and toys (unless these items will be moved with the resident). Relocation is usually a substantial undertaking, involving not only the movement of people and their possessions, but also the coordination of mail, phone, school, and community changes. Whenever possible, children should continue to attend the same school during the relocation period, even though this may involve finding special transportation. Due to their complex nature, relocation considerations may dictate the scheduling of projects.

9.3.3.2 Relocation due to existing lead hazard risks

If lead hazards are found to exist and not controlled within 15 days, children under six and pregnant women should be relocated to comparable facilities.

9.3.3.3 Relocation due to lead hazard control project

Occupants in the area of work that may create additional lead hazards should be relocated. This temporary relocation from the area or dwelling unit should continue until the area has been cleared for reoccupancy.

9.4 Protecting Occupants During Lead Work

Any activity that disturbs lead-based paint can generate leaded dust. While interim control activities are less likely to generate leaded dust than abatement activities, any scraping or sanding without high-efficiency particulate air (HEPA) attachments can generate dangerous levels of dust. Section 10.3.1 describes common contamination control procedures. Whenever potential dust-generating activities are carried out, residents and particularly young children should stay out of the rooms (preferably the entire house) and should not return until **all** dust and debris are removed and the dwelling unit has been thoroughly cleaned.

9.4.1 General procedures to limit contamination during work

The HUD Guidelines provide various preparation levels for lead hazard control jobs. The preparation levels can be found in the HUD Guidelines, Tables 8.1, 8.2, 8.3, and should be considered when performing lead hazard control work. Since each work-site is unique, it is necessary to pick the level that is most cost effective for each specific situation. A certified risk assessor, a certified abatement supervisor, or a trained lead-based paint planner/designer should make this judgment. The tables provide guidance on choosing the appropriate preparation level for each job.

The necessary worksite preparation level will depend on:

- The size of the surface(s) needing work.
- The type of hazard control methods to be used.
- The extent of existing contamination.

- The building layout.
- The vacancy status of the dwelling.
- The types of worker protection needed.
- The need for other construction or abatement work (e.g., renovation or asbestos abatement).

A certified individual should weigh all of these issues in determining which level of preparation is appropriate for a given situation. For example, the enclosure of walls will probably require a lower worksite preparation level than wet scraping of a large area, since enclosure will generate less dust. Similarly, deteriorated component replacement (demolition work) will probably require a higher containment level than the wet scraping of a small area.

The HUD Guidelines are performance oriented and are not specifications. However, an example specification can be found in Appendix 7.3 of the HUD Guidelines. It may be possible to select elements from different worksite preparation levels to devise a unique worksite preparation plan for an individual dwelling. Whatever the combination of containment measures elected, the levels of leaded dust outside the containment area must not rise above clearance levels. Containment measures should be designed to prevent the release of leaded dust, which can be spread by workers' shoes or by airborne dust.

9.4.2 Relocation of occupants during work

For some small lead control projects occupants may be "relocated" within their own unit. As a general rule, residents should always have access to a bathroom. As an absolute rule, residents must always have a means of egress out of the unit (i.e., in the event of fire) without passing through the work area. The HUD Guidelines Tables 8.1-8.3 provide specific guidance on when occupants should be relocated based on the Scope of the lead control project. The NIBS *Guide Specifications for Reducing Lead-Based Paint Hazards* also provides guidance on occupant relocation based on work level.

It remains important to consider other safety and health issues besides lead that may require occupancy relocation. The planned work may require disconnection of the electrical service or heating. Replacement of lead-containing pipe may not pose a significant lead hazard, but no water will be available to the residents for the project duration.

9.4.3 Protection of occupants' belongings

Prior to beginning any lead control project likely to generate lead dust, all occupant belongings should be removed from the work area. Any belongings that will remain in a work area should be covered and protected.

9.4.4 Cleaning and storing occupants' belongings

If an occupant's belongings are removed from a work area they should first be cleaned if there is visible dust and debris. The visible dust or debris may be contaminated with lead and should be cleaned prior to storing an occupant's belongings in a secure location during a lead hazard control activity.

9.4.5 Control of the work site to prevent unauthorized access

The work site should have barriers in place to prevent unauthorized access to the work site, including lead hazard warning signs to dissuade entry by unprotected and untrained personnel. When work is not in progress, the work area should be locked, if feasible. Some projects may require the employment of a security guard to maintain site security when work is not on-going. When work is in progress, one worker (or other designated person) should be available outside the barrier containment (if applicable) to prevent entry by unprotected persons.

9.4.6 Control of work practices

Protecting occupants from lead exposure during lead control projects is best performed by minimizing the amount of lead dust generated by the work. Consistent oversight of the work by the contractor and a quality control representative will help reduce the generation of lead dust. If the dust can be controlled at the source, clean up will be simplified, and the risk of lead dust being carried into adjoining areas will be reduced.

CHAPTER 10: ENVIRONMENTAL SAFETY AND HEALTH PROGRAMS

[This chapter corresponds to ASTM E 2052, section 11]

10.1 Overview of Environmental, Safety and Health Programs

The environmental, safety and health programs are designed to protect personnel from exposure to hazards and the environment from contamination during lead hazard control activities. The effort required to establish and implement these programs will vary, depending on the control options that are being utilized in the facility.

An overview of the development and implementation of environmental, health, and safety programs is provided in Figure 10.1. The Occupational Health and Safety Program, as the name implies, incorporates worker protection measures from various applicable OSHA regulations and the HUD Guidelines. The Environmental Protection Program addresses two specific areas, containment of lead dust and waste management. EPA, state, and local regulatory requirements as well as information from the HUD Guidelines are important references for developing the Environmental Protection Program.

10.2 Occupational Health and Safety Programs

At a minimum, the Occupational Health and Safety Program will need to cover those facility employees who conduct maintenance activities that disturb lead based paint and/or who conduct cleaning activities involving lead-containing dust or debris. If a contractor performs interim control or abatement procedures, the contractor will be responsible for instituting his/her own Occupational Health and Safety Program. The building owner/manager should require contractors performing work in their facilities to provide a copy of their program as part of the scope of work or project specifications.

An example outline for a written Occupational Health and Safety Program is provided in Exhibit 10.1. The elements parallel the requirements of the OSHA Lead in Construction Standard (29 CFR 1926.62)

10.2.1 Written lead compliance plans

A written lead compliance plan is required for all projects where the airborne level of lead is expected to exceed the OSHA permissible exposure limit of $50\mu g/m^3$. The plan must be written before the commencement of the project and provide the information required by OSHA under 29 CFR 1926.62 (e) (2). Although the plan must be specific for each project, there are many sections of the plan that will apply from one project to the next.

OSHA does not specify who must prepare the written plan. It is usually prepared by an industrial hygienist familiar with the project. The industrial hygienist should develop the plan with input from the competent person who will work the project on a day-to-day basis. This will help ensure the plan is implemented and followed.

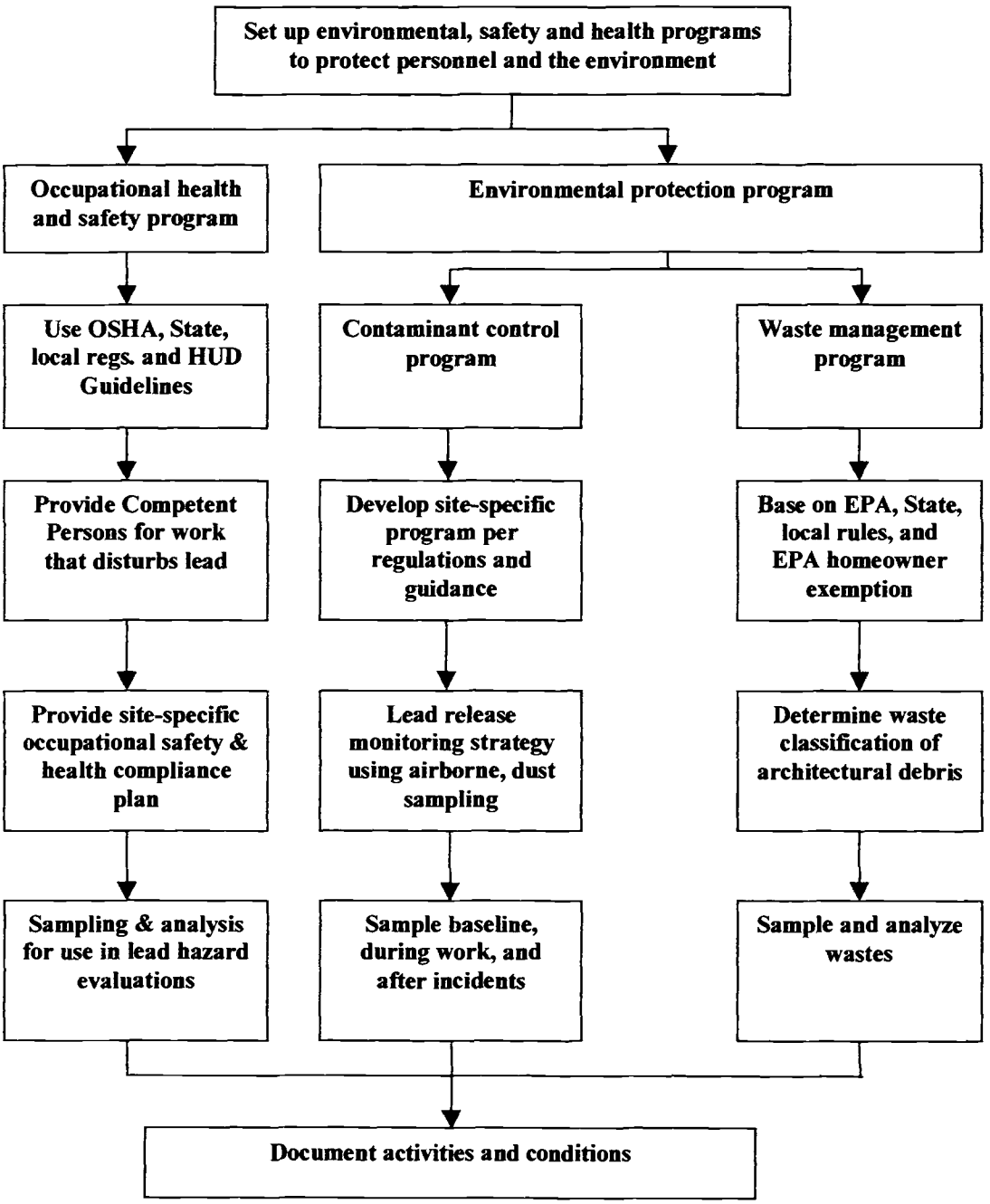
Chapter 9 of the HUD Guidelines provides a Model OSHA Written Compliance Plan that is a good starting point for the development of a site specific plan. Some sections of the Model Plan will need to be tailored to the specific lead hazard control activities that will be conducted in the facility. The elements in the Model Plan include:

- Date plan was developed
- Project locations
- Brief description of project
- Project start and end dates, and schedule for sequence of work
- Equipment and materials that will be used
- Crew names and assigned tasks

Exhibit 10.1 Example Outline for Occupational Health and Safety Program

I.	Purpose and applicability of the Program
II.	Key Responsibilities
III.	Lead Compliance Plans
IV.	Designation and Assigned Responsibilities of Competent Person(s)
V.	General and Site Specific Training Requirements
VI.	Engineering and Work Practice Controls
VII.	Respiratory Protection Program
VIII.	Protective Clothing and Equipment
IX.	Housekeeping Procedures
X.	Hygiene Facilities and Practices
XI.	Medical Surveillance Program
XII.	Hazard Communication Program
XIII.	Signs
XIV.	Other Safety and Health Considerations
XV.	Documentation and Record Maintenance

Figure 10.1 : Environmental, Safety, and Health Programs



- Designated competent person and description of responsibilities
- Control measures that will be used
- Technology considered in meeting PEL
- Types(s) of respiratory protection that will be used for each activity (Respiratory Protection Program to be attached)
- Protective clothing
- Hygiene facilities
- Review of previous air monitoring data for similar activities
- Description of Medical Surveillance Program
- Description of training provided to the workers, contact information for who conducted the training, when the training was conducted, list of workers trained and social security numbers
- Signature of person who developed the plan and the date it was completed

OSHA requires the plan to be revised and updated on a regular basis, at a minimum every six months. Copies of these written compliance plans must be maintained at the work site and made available for employee review and examination.

10.2.2 Competent Person(s)

A competent person must be assigned to all projects that disturb lead. The competent person has the designated responsibility of ensuring that the lead hazard control work is performed in a safe and healthful manner and in accordance with the provisions of the Occupational Health and Safety Program. The competent person is required to make regular and frequent inspections of the job site, materials and equipment.

10.2.2.1 Duties and responsibilities in accordance with SSPC-QP2

A "competent person" is defined by OSHA as one who is capable of identifying existing and predictable hazards at the work site, and who has the authority to ensure prompt corrective measures are taken to eliminate them. The competent person should have the responsibility and authority to stop work, if necessary, until any problems identified are corrected. The definition provided in the Steel *Structures Painting Council Qualification Procedure No. 2: Standard Procedure for Evaluating the Qualifications of Painting Contractors to Remove Hazardous Paint* (SSPC-QP2) is similar, with the addition that the competent person should also be able to recognize working conditions or surroundings that are unsanitary or dangerous to employees.

The primary responsibilities of the competent person as defined in SSPC-QP2 include:

1. Monitoring effectiveness and ensuring the continued integrity of environmental controls.
2. Supervising worker exposure monitoring or overseeing monitoring activities performed by others.
3. Ensuring that a hazard communication program and other applicable training has been conducted for the contractor's personnel on site.
4. Ensuring that employees working in the exposure area are wearing personal protective equipment and are trained in the use of such equipment and in the use of exposure control methods, personal hygiene facilities, respiratory protection, and decontamination practices.
5. Ensuring that the engineering controls in use are in operating condition and functioning properly.
6. Ensuring that fugitive emissions to air, water, or soil are minimized and that handling of all waste streams is in compliance with applicable regulations and contract specifications.
7. Controlling access to the work site and ensuring that contaminated control boundaries are marked off. (This includes posting lead hazard work areas with warning signs).
8. Maintaining project documentation, such as exposure assessment results, ventilation performance checks, respirator fit tests, personal monitoring results, results of site safety inspections, and medical surveillance results.

10.2.2.2 Qualifications needed per OSHA and ASTM E 2052, Section 17

In order to perform their assigned duties, competent persons for lead projects should have knowledge of the likely lead exposures for each hazard control option; the potential hazards associated with lead exposure and other substances or physical agents in the worksite; the appropriate engineering controls, work practices and personal protective equipment for the project; and the requirements of the various applicable OSHA construction standards.

The qualifications of the competent person should include:

- Accreditation as a "supervisor" in accordance with 40 CFR part 745 (40 hour training by an EPA or state approved training provider) and annual refresher training
- Training on OSHA required topics
- Training on the site-specific hazards and the written OSHA Compliance Plan
- at a minimum two years of experience conducting lead hazard control projects

Consultants and contractors are responsible for ensuring that all of their personnel assigned to a lead project are trained and certified. The building owner should ensure that the training provided to these employees is EPA or State approved. A random selection of names and a request for the review of their original certifications should be performed before commencing any project.

10.2.3 Site specific training

All personnel who are assigned work at a lead abatement project must be trained and certified in accordance with EPA 40 CFR Part 745. However, specific site training and orientation is required by OSHA. This training should include the specific engineering controls and work practices that will be used, those activities which could result in exposure to lead above the action level, and the requirements of the OSHA Lead Compliance Plan developed for the project.

It may also be necessary to train personnel in the use of tools and equipment at the project site. Employers should only permit those employees qualified by training or experience to operate equipment and machinery. A record of all site training should be maintained with the records of that project.

10.2.4 Exposure assessment

Lead exposure is highly likely if the project involves the disturbance of lead-containing materials. A lead disturbance can be caused when making alterations, or during demolition, repairs, additions, and maintenance. OSHA noted in the preamble to their standard that there were wide variations in the exposures for certain construction activities.

Sources of variability in exposure levels for the same activity include:

- the concentration of lead in the paint
- the total quantity of lead containing material to be removed
- work practices
- weather conditions on outdoor projects

The procedures for conducting exposure monitoring are explained in detail in Chapter 9 of the HUD Guidelines. Generally, unless the employer has exposure data from a nearly identical project conducted within the past 12 months, full-shift personal air sampling must be conducted for workers expected to incur the highest exposures. This is termed initial exposure monitoring.

Until the personal air sampling results are known, workers must use protective clothing and respirators assigned by OSHA (29 CFR 1926.62) for the specific tasks they are doing.

The tasks are grouped into three categories based on the potential airborne lead level that may be reached while performing the activity. For example, the presumed exposure that would result from manual scraping is between 50 $\mu g/m^3$ to 500 $\mu g/m^3$ and workers would be required to wear, at a minimum, half-mask air purifying respirators. The predicted exposure during abrasive blasting is greater than 2,500 and workers would be required to wear an air-supplied respirator.

Figure 10.2 Personal Exposure Monitoring

In addition to the protective equipment, employees must also be provided changing areas, hygiene facilities, biological monitoring, and training.

If this monitoring shows airborne concentrations of lead to be below the action level of 30 $\mu g/m^3$, then further monitoring is not required and the employer can discontinue the interim protection for any employee performing one of these tasks. It is important to document that the employee's exposure is below the PEL.

If this initial exposure assessment indicates that airborne concentrations are above the action level (30 $\mu g/m^3$), but below the PEL (50 $\mu g/m^3$), then monitoring must be repeated

at least every six months. If exposures are above the permissible exposure limit, the employer must perform monitoring every three months. Monitoring is then required to be repeated until at least two consecutive measurements taken at least seven days apart are at or below the action level (30 $\mu g/m^3$).

Employees must be notified of their exposure assessments, in writing, within five working days. This written notification can be either handed to the employee or posted at a place where employees have normal daily access. Whenever exposure monitoring indicates that employee exposures were above the permissible exposure limit, employees must be informed of that fact together with the corrective actions taken to reduce that exposure.

If the employer is relying on previous monitoring data to determine that employee exposures will be below the action level for one day or more, the employer must make a written statement on how their employee' exposures were determined.

10.2.5 Engineering and work practice controls

OSHA requires the use of engineering and work practice controls to reduce employee exposures as much as possible. If these controls do not reduce employee exposures below the PEL, then respirators must be provided. OSHA does not specify the engineering controls and work practices that should be used, but other resources such as EPA training manuals, the HUD Guidelines, and the NIBS specifications provide detailed information.

Good engineering controls are aimed at isolating the work area and containing the lead dust at its point of generation. High efficiency particulate air filters are used on vacuum cleaners and local exhaust ventilation for equipment such as needle guns, sanders, grinders, and abrasive power tools used to remove lead-containing coatings. Large air movement machines equipped with HEPA filters can be used to reduce airborne dust in the work area. A light application of water to surfaces in the work area with a fine mist sprayer is another method for reducing dust levels.

Figure 10.3 Worker using a HEPA filtered vacuum

Work practices that can help limit airborne lead dust include wetting the surfaces while scraping, using chemicals for paint removal as opposed to manual or mechanical methods, and limiting of the amount of material to be worked on at any given time. Daily cleanup of the work area and equipment also helps prevent accumulation and re-suspension of dust.

10.2.6 Respiratory protection program

Even though work practices and engineering controls are implemented, it is likely that respiratory protection will be necessary for most hazard control activities. Because there are recognized health effects at blood lead levels below what is allowed by OSHA, it would be prudent for workers to use respirators, even when their exposures are below the PEL.

Employers who issue respirators must establish a written respiratory protection program and an assigned program administrator in accordance with the OSHA respirator standard (29 CFR 1910.134). Once implemented, the program must be updated as necessary to reflect any changes in workplace conditions that may affect respirator use. The building owner/manager should consider utilizing the services of an industrial hygienist or other trained safety and health professional to develop the respirator program and assist in the selection of respirators for various working conditions.

The elements that must be included in a respirator program are briefly described below. More detailed information is available in the EPA training curriculum for lead supervisors

and the NIOSH publication, *Guide to Industrial Respiratory Protection* [DHHS (NIOSH) Publication No. 87-116].

- **Procedures for selecting respirators** – Respirator selection should be based on the maximum airborne concentrations of lead, expected or measured, according to Table 1, 29 CFR 1926.62. All respirators used for employee protection must be approved and certified by the National Institute of Occupational Safety and Health.

- **Medical evaluation of employees required to use respirators** – Before anyone is issued a respirator, a licensed health care professional must determine if the individual is physically able to perform their duties while wearing a respirator.

- **Fit testing procedures for tight-fitting respirators** – Qualitative or quantitative fit tests must be performed at the time of the initial fitting and at least annually thereafter for employees who wear negative-pressure respirators.

- **Procedures for proper use of respirators in reasonably foreseeable emergency situations** – Training should include instruction on the type and use of respirators to be used in emergency situations such as fire, entry into oxygen deficient atmospheres, or spills of toxic substances.

- **Procedures and schedules for cleaning, disinfecting, storing, inspecting repairing, discarding, and otherwise maintaining respirators** – For filter respirators, an adequate supply of filters must be maintained on the job site and employees must be instructed to change the filter elements whenever an increase in breathing resistance is detected.

- **Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere supplying respirators** – OSHA prescribes the maximum level of certain contaminants that can be present in breathing air; the maximum pressure where the hose attaches to the air supply; the minimum and maximum flow rates for helmets, hoods and tight fitting facepieces; and the minimum and maximum hose lengths for use with atmosphere-supplying respirators.

- **Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations** – Information would not only include lead hazards but other chemicals that may be used during the removal of lead materials such as caustics, acids, and solvents.

- **Training of employees in the proper use of respirators, including putting them on and removing them, any limitations of their use, and their maintenance** – Employees should be provided hands on training to become comfortable with wearing the respirator and ensuring its effectiveness.

- **Procedures for regularly evaluating the effectiveness of the program** – The written respirator program must include provisions for periodic review of the various facets of the program with respect to conditions in the workplace. There should be documented evidence of a regular evaluation of the program.

10.2.7 Protective clothing and equipment

The Occupational Health and Safety Program should describe the types of protective equipment that will be worn while workers are conducting various lead hazard control activities and the respective cleaning and/or disposal requirements. Employees must be

Figure 10.4 Worker wearing a half-mask air-purifying respirator and disposable coveralls

trained on the limitations of protective equipment, how to properly wear and remove it, how to maintain it, and how to select the equipment most appropriate for the job.

In addition to respirators, there are four categories of personal protective equipment:

Protective clothing

Coveralls (reusable)
Coveralls (disposable)
Underwear (disposable)
Chemical suits

Protective clothing must be used whenever the airborne concentration of lead exceeds the permissible exposure limit (50 $\mu g/m^3$) and when it is not known if lead concentrations exceed the PEL (29 CFR 1926.62). The protective clothing should consist of coveralls or full body work clothing, gloves, hats, boots and disposable boot coverlets.

The purpose of the full body coverall is to prevent the body from becoming grossly contaminated and to prevent the transportation of lead materials and dust from the regulated area. The full body protective coverall (made of the proper material) can also provide a protective barrier against chemicals used to remove lead-based paints. For lead hazard control projects, disposable coveralls are typically used. If non-disposable coveralls are provided to workers, the employer is responsible for laundering the coveralls. Employees with personal exposures above the PEL must be supplied clean work clothing at least weekly. If the PEL exceeds 200 $\mu g/m^3$, clean clothing must be supplied daily. Often workers conducting lead hazard control activities dispose of their coveralls each time they leave the work area.

Hands and Feet

Gloves
Safety shoes

Injuries to hands and fingers are among the most numerous recorded by industry and construction workers. To help prevent these injuries, suitable hand protection should be issued. This is of special importance for lead abatement work, particularly when work practices such as hand scraping or chemical removal procedures are used. Gloves that have been designed to protect the hands from scratches, work blisters, chemicals, and burns offer the most protection. The selection of the right type of glove is important. Issuing the wrong glove may result in the very injury it was intended to prevent.

Foot protection is often overlooked when performing light construction work such as painting and remodeling. Although most foot accidents are caused by objects falling on them or from puncture wounds through the sole of the shoe, many workers still wear sneakers and rubber soled shoes to work. Work boots should be worn at a lead abatement site. If the work involves the removal of architectural components or other activities that pose a danger of falling objects, steel-toed boots should be required.

The use of disposable boot covers prevents the boots from becoming contaminated and helps prevent the spread of contamination. This is achieved by requiring the boot cover to be removed each time the employee leaves the regulated area.

Head Protection

Hard hats
Hair protection
Hearing protectors

The OSHA construction regulation 29 CFR 1926.100 outlines the requirements for head protection. If workers are working in areas where there is a possible danger of head injury from impact, from falling or flying objects, or from electrical shock and burns, they must be provided with and protected by protective helmets. Protective helmets would typically be required if the lead abatement involved the removal and replacement of architectural components.

Because the hair is one of the most difficult parts of the body to clean, particularly of dust and other airborne contaminates, hoods (usually attached to coveralls) must be worn on lead hazard controls projects. Lead dust can be easily transmitted from hands to mouth if employees run their fingers through their contaminated hair and then proceed to eat.

The use of hearing protection may also be necessary on lead abatement projects. Prolonged exposure to the high pitched whine of many of the hand tools used in the abatement effort can cause long term hearing loss. Hearing protection for the construction industry is covered by 29 CFR 1926.52 and 29 CFR 1926.101. These regulations require employers to control noises whenever feasible, or provide ear protective devices whenever noise levels exceed the permissible exposure limits

Face and Eyes Protection

Goggles and spectacles
Face shields

Eye protection must be provided whenever there is a potential for eye or face injury (29 CFR 1926.102). Eye protection must be comfortable to wear, fit snugly, and not interfere with the movement of the wearer. The equipment must be durable, easily cleaned and capable of being disinfected. Eye protection requirements for lead abatement may include goggles, glasses, and/or face shields. Equipment designed to provide the wearer with protection against flying particles and splashes is most appropriate for lead abatement work.

10.2.8 Housekeeping

It is important to keep the work area clean. This prevents the spread of contamination and reduces the amount of lead that can become airborne. OSHA requires that all surfaces be

maintained as clean as practicable of lead dust. The clean-up effort is considered a work practice control and is used to keep airborne lead levels below the permissible limits. Housekeeping is achieved primarily by wet wiping methods and vacuuming with HEPA filtered vacuums. Dry or wet sweeping, shoveling, or brushing, cannot be used unless vacuuming or other equally effective methods have been tried and found not to work.

10.2.9 Hygiene facilities and practices

Hygiene facilities must be provided by the employer whenever airborne lead levels exceed the permissible exposure limit (50 $\mu g/m^3$). The use of these facilities helps to control employee exposures to lead, and prevents the tracking of lead dust to areas outside the regulated area. The employer must provide a clean area for changing from street clothes into work clothes and shower facilities where feasible. The standard also requires the employer to provide storage facilities for street clothing. Clean areas for workers to eat, drink, and smoke must be established outside the regulated work area.

Due to the risk of exposing people outside the work area (i.e., family members) to lead dust on clothing, skin, and hair, precautions should always be taken to properly decontaminate. Even when not required changing into a separate set of work clothes or coveralls and careful cleanup after work is recommended.

Hand washing facilities must be provided at all locations where lead is detectable. Employees must wash their hands and face at the end of each work shift and before eating, drinking, smoking etc.

All hygiene facilities must be maintained in a clean and sanitary condition. The concentration of lead dust on surfaces in the hygiene facilities must be maintained below $100\mu g/ft^2$. This is determined by a wipe test.

10.2.10 Medical surveillance

Detailed guidelines on medical surveillance of lead exposed workers is provided in Appendix C of 29 CFR 1926.62. The written procedures for the medical surveillance program should describe who must receive biological monitoring and when; who must receive medical examinations and when; the physician that will conduct the examinations; a mechanism for multiple physician review; the information regarding work activities that will be provided to the physician; the information that must be provided by the physician to the worker and employer; the means for notifying employees about biological test results and medical examinations; and procedures for medical removal protection.

All employees exposed to lead at airborne levels above the action level on any day must be provided with initial medical surveillance. This consists of a blood test and analysis for lead and zinc protoporphyrin levels.

For employees who are exposed to lead at levels above the action level for more than thirty days a year, the employer must make available the required medical surveillance including a multiple physician review. These employees must have their blood lead levels measured every 2 months for the first six months and then every six months thereafter. If blood lead levels reach 40 μg/dl, follow-up blood test must be performed every two months until two consecutive blood samples indicate blood lead levels below 40μg/dl. Employees whose blood lead level exceeds 40μg/dl must be informed that they will be placed on medical removal if their blood lead levels exceed 50μg/dl. Employees must be informed of their blood lead monitoring results within five working days after receipt.

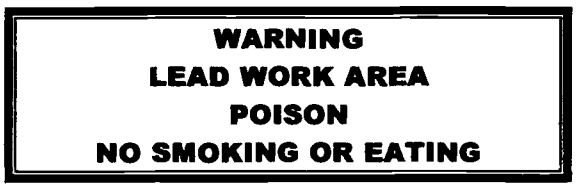
Following the initial medical examination employers are required to provide routine examinations to certain employees. These include employees who require advice concerning the effects of their exposures and their ability to have healthy children, employees that exhibit any signs of lead poisoning, and employees whose blood lead level exceeded 40μg/dl during the previous twelve months.

10.2.11 Hazard communication

Employers are required to establish a written Hazard Communication Program for all construction workers that are potentially exposed to hazardous materials (29 CFR 1926.59). All of the hazards associated with lead related activities must be communicated to the workers through appropriate labels on chemical containers, material safety data sheets for hazardous chemicals that are being used to perform the project, and site-specific information and training.

10.2.12 Signs

Signs must be placed at all entrances to the lead regulated area whenever lead exposures are above the permissible exposure level (50 $\mu g/m^3$). The signs must be prominently displayed and illuminated. Signs may be displayed in other languages, but must always be displayed in English. The wording of the sign is specified by OSHA, but other agencies such as HUD and some state regulations require differently worded signs to be displayed. In many situations the display of more than one sign may be required. An example of the OSHA sign that must always be displayed is provided below.



10.2.13 Other safety and health considerations

Depending on the complexity of the lead hazard control project, a variety of safety and health issues unrelated to lead may need to be addressed. Examples of such issues are discussed below.

One of the biggest problems other than lead on an abatement site is electricity. Under OSHA's focus program, it is ranked the fourth most likely hazard to result in a workplace fatality. Seventeen percent of the fatalities at the worksite are a result of electrocution. Electrical wires in walls and ceilings can be damaged and cause electrical shocks during demolition of wood trim, windows, and doors.

Air movement machines (negative air machines) draw a lot of amperes when they start up, and typically require 10-14 amps to operate. This can put a lot of strain on old wiring, loose connections, and worn outlets. These conditions can cause arcing of the electricity, which in turn can cause fire. In older homes the wiring may not be sufficient to support this kind of amperage.

Due to these many electrical hazards associated with lead abatement work, power to the regulated area may need to come from an outside source such as a generator. The power supply in the regulated area should be turned off and the switches locked and tagged out. Only circuits protected by Ground Fault Interrupter (GFI) should be used. The use of water (dust suppression) should be limited around outlets and other electrical devices. All electrical tools should be maintained in good condition and checked before each use. Any defects should be immediately repaired or the tool should be taken out of service and tagged not for use.

Metal ladders can also pose a problem because electricity travels easily through metal. For this reason, fiberglass rather than metal ladders should be used on lead abatement projects.

The conditions at some lead hazard control projects are susceptible to fire. This is due in part to the construction of containment barriers, which restrict entry to and from the regulated area. The polyethylene is a high smoke generator and even a small fire can quickly result in restricted or no visibility. Strong drafts created by air moving equipment may also be present that would promote the rapid spread of fire.

For these reasons the site must be set-up to promote quick egress in the event of a fire or other emergency. All areas should be marked with arrows to show the way out. Painting arrows to exits on the floor plastic is a good idea to help a worker who must crawl out of a work area. The site should be equipped with fire extinguishers that are rated for the types of fires that may potentially occur.

A fire escape plan should be posted at the project site and any emergency telephone numbers displayed

Heat stroke and heat stress is another safety consideration on a lead abatement project. The conditions that induce heat related problems are caused by protective clothing, limited airflow, and the shut down of power sources that prevent the use of air conditioning. These conditions are exacerbated by the restriction on drinking fluids in the work area. To combat heat stress, frequent breaks should be scheduled and ample amounts of water and other non-diuretic beverages should be supplied to employees.

Some of the other OSHA standards for construction (besides 29 CFR 1926.62 for lead) that are or could be applicable to lead hazard control projects include:

Employee Training
29 CFR 1926.21
Hazard Communication
29 CFR 1926.59
Respiratory Protection
29 CFR 1910.134
Written Emergency and Fire Prevention Plan
29 CFR 1910.38
General Safety and Health Provisions
29 CFR 1926.20
Medical Services and First Aid
29 CFR 1926.50
Occupational Noise Exposure
29 CFR 1926.52
Gases, Vapors, Fumes, Dusts, and Mists
29 CFR 1926.55
Ventilation: Welding, Cutting, or Heating of Toxic Metals
29 CFR 1926.353(c)

10.2.14 Records

There are many record keeping requirements imposed by OSHA and EPA for even the smallest of lead abatement projects. It may also be desirable, in the interest of employer liabilities, to document other non-mandatory items. A good rule of thumb is "If it's relevant to the project keep a record". Records required by OSHA include exposure assessments, medical surveillance, medical removals, and documentation of initial and annual training. OSHA requires the maintenance of

exposure assessments and medical records for the period of employment plus thirty years. Employers are required to provide employees with copies of their medical records upon request.

Medical removal records must be kept for the duration of employment and training records for one year beyond the duration of employment.

Documentation of training and certification required by 40 CFR Part 745 should also be maintained. This EPA regulation requires all persons working on Target Housing and Child Occupied facilities to be initially trained and attend update training by state or EPA approved training providers.

It is recommended that a project log book be maintained for each lead hazard control project. If the project is conducted by a contractor, the building owner/manager should require the submittal of a copy of the log book as part of the project records. The log book is a diary of the events for each day, a record of any personnel visiting the site, and other information relevant to the health and safety inspections made by the competent person. The log book should have bound numbered pages. This prevents the changing of statements made and the removal of pages. Entries that are incorrect should be crossed out in such a way that they can still be read. Each page of the log book should be signed and dated. The person signing the page should always print their name underneath their signature in a readable manner.

10.3 Environmental Protection Program

10.3.1 Contamination control procedures

Contamination control procedures must be established to ensure that releases of lead from worksites are prevented or controlled. Lead generated during lead hazard control activities can result in air pollution, water pollution, and/or soil contamination if it is not properly contained. The deposit of more than one pound of lead into the environment is a reportable quantity according to RCRA. One pound of lead can be generated from about fifty square feet of a multi-layered painted surface.

The release of lead into the environment can be controlled by minimizing the amount of lead dust generated through work practices such as wet-scraping or chemical removal; by capturing the lead dust at its source using equipment equipped with HEPA filtered local exhaust; and by constructing containment barriers.

When conducting an exterior lead hazard control project, the ground adjacent to the building should be protected with multiple layers of various materials. Typically this barrier includes one layer of heavy re-enforced tarp or polyethylene placed directly on the ground, two layers of six-mil polyethylene, and half-inch plywood on top to provide a firm footing for ladders, personnel and scaffolding.

Wind screens may be erected for exterior lead work to prevent wind dispersion of lead dust, particularly when wind speeds are expected to exceed 15 miles per hour. Alternatively, enclosures may be built around scaffolding at low and high locations. In areas where houses are close together, polyethylene should be placed over the door and widows or other openings of adjacent buildings when performing exterior lead work. When removing lead-based paint from exterior windows, a polyethylene barrier should be placed over the interior side of the window to prevent infiltration of lead dust.

The spread of lead contamination during interior lead hazard control projects can be minimized by placing drop cloths over floors and other objects that can't be removed from the work area; installing critical barriers over windows and doors; and erecting polyethylene barriers from floor to ceiling. Heating, ventilating and air conditioning systems should be shut down and the vents covered with polyethylene to prevent contamination of the system and dispersal of lead dust. The extent of containment will depend on the potential for the project to generate lead dust and/or debris.

During lead hazard control projects, the water used for showering or washing hands, for pressure removal or cleaning, and during clean up is likely to be contaminated with lead.

The wastewater from the hygiene facility and wash water used in conjunction with cleaning is regulated by the Clean Water Act. Water from these sources is not subject to RCRA requirements. Local waste water treatment plants may require notification if more than ten gallons of water is discharged from mopping or cleaning operations. They may also require the wastewater to be filtered before discharge into their system. The waste water from mopping and cleaning is easily filtered and can be passed through a course filter to remove large paint chips and debris, then through a 20 μm pore size filter before discharge.

Wastewater from pressure washing is governed by RCRA and must be collected at the point of generation. This water must not be allowed to spill onto the ground for natural percolation into the soil. Ground covers made out of tarps and polyethylene, as previously mentioned, can be attached to the building and the edges raised in such a manner as to provide a containment water catchment system. Run off or major leaks from this catchment system are not allowed. Four by four lumber is ideal for raising the edges of the tarps and the polyethylene barriers. Where possible a sump can be dug into the ground to facilitate easy pick up of water.

Figure 10.5 Containment for an exterior lead abatement project

The wastewater and separated materials are subject to leachate testing in compliance with 40 CFR Part 261. If the wastewater is less than 5 ppm lead, it can be disposed into the waste water system.

It is always advisable to contact the wastewater treatment department before any discharge is made from a lead abatement project. Some local wastewater departments may not accept water from lead abatement operations.

Wastewater sampling should be sufficient to provide statistically reliable documentation if the waste is not being disposed of as lead contaminated wastewater. Filtering of all wastewater should be considered as part of a waste minimization program.

The contamination of soil at the abatement site can occur as a result of poor containment systems or sloppy work practices. Poor worker decontamination practices can result in the transport of lead on the soles of work boots or from dirty work clothing. A path to a waste dumpster, shower facility, office, or a site storage facility are prime areas for soil contamination by tracking.

10.3.2 Containment and monitoring plans

A site-specific containment and monitoring plan should be developed for every lead hazard control project. The location and types of containment systems should be well planned before the commencement of any activity involving the disturbance of lead containing materials.

At the same time, a plan for monitoring the regulated area and the area surrounding the regulated area must be established. This is done by the collection of air, soil, and wipe samples.

The environmental program should reflect the sample requirements for the project before, during, and after the work, and define the level of clearance expected in each area. There is no set number of samples that must be taken. A sufficient number of samples should be collected to obtain statistically reliable information. The results of these measurements will help determine the effectiveness of the controls and the containment system.

HUD has established lead dust levels that are widely accepted as the standard for determining if areas are clean or require cleaning. These dust level measurements are also used as the criteria for determining if a project has been thoroughly cleaned. They are often referred to as the clearance levels.

These clearance dust levels are:

- 100 $\mu g/ft^2$ for floors
- 500 $\mu g/ft^2$ for interior window sills
- 800 $\mu g/ft^2$ for window troughs and exterior concrete or other rough surfaces

10.3.3 Air sampling and dust sampling

Air sampling is not widely used for area monitoring of lead hazard control projects. This is due to the limited amount of distance the dust can travel and the rate at which the dust settles from the air. An analysis of the settling velocity of airborne leaded particulate has demonstrated that nearly all particulate greater that 5 μm in diameter will have settled out of the air within one hour. The monitoring of the area therefore provides information that is only relevant to that period of time represented by the sample.

Air monitoring is however important to determine the exposure of employees to lead within their breathing zones. OSHA requires the employer to conduct personal exposure monitoring for most lead hazard control projects.

Dust sampling can be used to evaluate the current lead dust hazard, the extent of existing contamination, the dust hazard generated by the abatement work, the spread of contamination from dirty areas to clean areas, and the level of cleanliness following the work. Dust samples are usually collected by wet wiping a known surface area.

The selection of dust sampling locations is based on a visual assessment, the areas where lead hazard control work has been performed, and to some degree professional judgment. Dust samples should not be collected from predetermined areas, otherwise the clean-up effort may be biased.

HUD requires samples to be collected from floors, window sills, and window troughs to determine if an area has been cleaned and is acceptable for re-occupancy. These levels have been generally accepted by the industry and are now established as the clearance requirement for most lead hazard control projects. It should be noted that these levels of lead dust are representative of the cleanliness of surfaces that are within the reach of small children. These levels would not be used for industrial work.

10.3.3.1 Baseline sampling before work

Collection of samples before the work commences is necessary to evaluate pre-existing conditions. For example, at many sites the soil around the foundation of the building or the drip line may show signs of lead contamination.

Samples collected before the project begins are called base line samples and the number collected will depend upon the size of the project. Small projects will not generate high volumes of dust and therefore will not warrant the same amount of sampling as a large project.

Baseline dust samples can be collected using dust wipe sampling or dust vacuum sampling methods as described in Chapter 17. The soil sampling methods for lead are also described in this chapter.

Possible locations for baseline samples include:

- HVAC ducts and distribution registers
- Floors outside the work area
- Inside cupboards that are to be sealed off during the work
- Any furniture that is to remain in the work area
- Carpets, drapes or curtains in the work area
- Carpets outside the work area
- The soil immediately outside the access door
- The soil beneath the drip line of a building (for exterior projects)

At the completion of the work these samples can be used to arbitrate any conflicts. They can also be used to ascertain the effectiveness of work practice controls.

10.3.3.2 Sampling during work activities

The containment monitoring plan should include procedures for collecting samples during work activities. The primary objective of the sampling is to determine if lead contamination is occurring outside the work area. If it is, then work practices and the integrity of the containment will need to be assessed. A second objective of sampling during work activity is to document the levels of lead outside the work area for project records.

The number, type, and frequency of samples collected depends on factors such as the likelihood of lead contamination (extent of the disturbance) and nearby receptors (i.e. occupants and buildings). The samples collected during work activities should be collected and analyzed in the same manner as the baseline samples to provide a basis for comparison.

10.3.3.3 Sampling after accidents or other lead related episodes

The containment monitoring plan should include procedures for collecting samples when a known release of lead from the regulated area occurs. Provisions might include the use of chemical spot tests (described in Chapter 17) as well as dust and soil testing to evaluate the level and extent of contamination. Chemical spot tests provide a quick indication for the presence of lead, but are not considered completely reliable.

The number and location of samples will depend on the magnitude of the release. There may be a need to request rush analysis for samples submitted to the laboratory.

10.4 Waste Management program

Chapter 10 of the HUD Guidelines provides an excellent discussion of hazardous and non-hazardous waste. It includes a step-by-step summary for managing waste generated from lead hazard control activities based on existing Federal requirements described below. The EPA has proposed an exemption for architectural components (as of May 1999) having lead-based paint. The reader is advised to consult the current federal regulations and applicable state regulations regarding waste disposal regulations.

10.4.1 Overview of regulatory requirements for lead waste

Wastewater from hygiene facilities and from cleaning operations can be disposed of in a municipal wastewater treatment system under the Clean Water Act. This discharge of lead contaminated water may be subject to filtration prior to discharge and notification to the wastewater plant. Local regulations should be checked to determine any other restrictions on the discharge of this wastewater.

EPA regulates solid wastes under the Resource Conservation and Recovery Act. Waste materials generated from most lead abatement projects are subject to the restrictions of these regulations. Some waste from households may be exempt from the RCRA requirements. This exemption applies to lead waste generated at a residence if it consists of materials generally found in household waste. This can include waste from routine maintenance that is generated by the homeowner. The removal and replacement of a rotted window or waste materials from an interim control project would fall into this category. However, waste materials from activities that are exclusively related to the abatement of a lead hazard from a home are not exempt. A window that is removed and replaced as an abatement activity and for no other reason would currently be subject to RCRA.

Even if the lead waste generated by an activity is not subject to Federal regulations, owners and property managers should determine whether the wastes are exempt from state and local hazardous waste regulations. In practice, users of commercial waste services may have to comply with hazardous waste regulation despite having an exemption.

RCRA defines a waste generator as any person at a particular site or location whose act or process produces a hazardous waste. As waste generators, owners of facilities where lead waste is generated must determine if the material is either a listed hazardous waste or a characteristic waste (according to leachate testing). Waste generators are categorized by the amount of hazardous waste produced at their site. The level of compliance that is required depends on the amount (and to some extent type) of hazardous waste produced.

Conditionally exempt generators are those who produce less than 100 kg/month (220 pounds) or 25 gallons of liquid. These generators are not allowed to store more than 1000 kg (2200 pounds) at any given time. Conditionally exempt generators must: 1) identify hazardous materials generated, 2) send hazardous waste to a hazardous waste landfill or other waste facility, or a landfill or other facility approved by the state for industrial or municipal wastes, and 3) never accumulate more than 1000 kg of hazardous waste.

Generators who generate more than 100 and less than 1000 kg of waste are small quantity waste generators. These generators can also produce up to 1 kg of acutely hazardous waste in any month. Small quantity generators can store up to 6000 kg of waste materials on site for up to 180 days, or 270 days if the waste material must be transported more than 200 miles to the closest waste facility. Stored waste must be kept in containers that are suitable for the particular type of waste material.

Large waste generators are those who generate more than 1000 kg/month or more than 1 kg of acutely hazardous waste in any month. These generators are only allowed to store waste for a period of 90 days. Large generators must comply with all applicable hazardous waste management rules.

With the exception of the amount of hazardous waste that can be accumulated and the length of time that the material can be stored on site, small and large quantity generators are typically subject to the same regulations. These include:

- Obtaining an EPA identification number.
- Meeting specified pretransportation standards.
- Completing hazardous waste manifest forms.
- Complying with land disposal restriction notification and certifications.
- Maintaining records.

EPA Identification Number - If an abatement project generates more than 100 kg of hazardous waste in a month, the waste generator must acquire an EPA waste identification number. This application is made on EPA form 8700-12, "Notification of Hazardous Waste Activity". The EPA will send the form to the waste generator with an accompanying instruction leaflet to assist in filling out the form. Once completed and signed the form must be sent to the state hazardous waste contact. EPA and the state will review the information on the form and EPA will assign an EPA waste identification number.

Each project location requires a unique EPA waste identification number. The purpose of this number is to enable EPA to track the waste should it be lost. These tracking numbers also provide EPA and the states with data for planning hazardous waste activities.

Pretransport Requirements – Generators who store hazardous waste onsite must do the following:

- Provide for proper storage and labeling of the hazardous waste, including the start date for accumulation.
- Have an emergency plan. Small generators must have basic information to be used in an emergency in their possession. Large generators must have a written plan.
- Provide personnel training on emergency spill and accident procedures.
- Develop written waste minimization plans

Hazardous Waste Manifest - A hazardous waste manifest must accompany the waste from the site of generation to the

disposal site. Each person who handles the waste, the state where it is generated, and if required, the state where the material is disposed must receive a copy of the waste manifest. The waste disposal site will send a copy back to the waste generator as acknowledgment of receipt of the waste. The generator must keep this copy together with the original. The copy sent back to the generator by the disposal site must be signed by the waste hauler and a representative of the designated disposal facility.

If the generator does not receive a waste manifest back from the designated disposal facility and efforts to track the shipment are unsuccessful, the generator must notify EPA or the appropriate State agency of lost shipments.

Although Federal regulations allow waste to be transported by the generator, the generator must obtain an EPA transporter identification number before the waste can be moved. (Some states only allow licensed haulers to transport hazardous waste).

The waste containers must also be in compliance with Department of Transportation (DOT) regulations for packing, labeling, marking and placarding (49 CFR Part 171-173). Along with these requirements there are other obligations under the Federal Motor Carrier Act requiring financial and liability responsibilities. There are some exemptions based on the size of the vehicle used to transport the waste, the size of the containers, and the "limited quantity exclusions" under the DOT regulations (49 CFR Part 171.101).

EPA Land Ban Requirements - The requirements of the Land Disposal Ban Notification and Certification rule (40 CFR Part 269.7 and 40 CFR Part 269.9) apply to generators who generate more than 100 kg per month of hazardous lead waste. EPA requires the treatment of hazardous waste materials before they are disposed of in a landfill. The treatment method is not specified, but it must prevent the lead from leaching into the soil. The treatment standards are listed in 40 CFR 268.41 through 268.43.

The generator must notify the hazardous waste treatment/disposal facility that the waste does not meet the land-disposal standards or certify that the waste does meet the standards.

Recordkeeping – The extent of submittals and recordkeeping will depend on the quantities of hazardous waste generated. Large quantity generators must submit biennial reports to the State hazardous waste agency or EPA regional offices that detail the generators activities. However, these reports are not usually required for abatement jobs that have a duration of less than two years.

Generators must document instances when a signed manifest copy was not returned by the waste management facility designated to receive the waste shipment. The documentation must also include the measures taken to locate lost shipments.

Generators must retain all manifests, results of hazardous waste testing, and land disposal notifications/certifications for three years. (A 10-year retention period is recommended.)

10.4.2 Characterization of Waste

The characteristics of a waste are determined by its flammability, corrosivity, reactivity, or its toxicity. Lead waste is generally identified by its toxicity, and is dependent upon the outcome of a Toxicity Characteristic Leaching Procedure (TCLP). If the TCLP results indicate leachable lead is present in concentrations of 5 ppm or more, the material is a hazardous waste material and must be disposed under RCRA Subtitle C regulations.

The samples for TCLP testing should be representative of the waste stream. This requires the waste samples to be collected from the various components in the same weight proportion as is found in the entire bulk of the waste. Methods for collecting representative samples of the waste stream are outlined in ASTM Standard Guide E 1908 for Sample Selection of Debris Waste from a Building Renovation or Lead Abatement Project for Toxicity Characteristic Leaching procedure (TCLP) Testing for Leachable Lead (Pb).

Other materials used in the removal of lead-based paint may also be subject to disposal as hazardous wastes. Many removal chemicals and paint solvents fall into this category. The selection of the chemicals to be used during the project can help reduce the amount of the hazardous waste stream.

10.4.3 Site specific waste management plans

Because of the extensive RCRA requirements for the disposal of hazardous waste and the associated disposal costs, the waste generated at a lead abatement site should be segregated into hazardous and non-hazardous wastes. The HUD Guidelines recommend segregating waste from lead abatement sites into four categories of "like materials": (I) low lead waste, (II) architectural components, (III) concentrated lead waste, and (IV) other waste. Example wastes for each category and the RCRA requirements are provided in Table 10.1. It is important to note that the generator is ultimately liable for any improper disposal. If there is any doubt about materials that will be placed in a category I waste stream, samples of these materials should be submitted for TCLP testing. For all categories of waste streams it is the generator's responsibility to document that the waste is hazardous or non-hazardous and that the prescribed management practices apply.

The segregation of these waste materials is usually controlled by either colored containers or by labeling. Employees should be told of the waste segregation requirements prior to working at the site to avoid the unintentional mixing of waste products.

10.4.3.1 Lead Waste Minimization Plans

RCRA regulations require small and large waste generators to develop a written waste minimization plan. The plan should outline the course of action the waste generator will take to reduce the hazardous waste during lead abatement activities. If a contractor conducts the lead abatement, then the scope of work should require the contractor to develop the written plan.

The plan should include procedures for:

- the prevention of mixing hazardous and non-hazardous waste

- the recovery of recyclable materials
  Examples: aluminum window frames,
  metal doors or door surrounds,
  glass from windows and doors,
  un-painted brick and concrete block,
  cement (Fill material)
- the cleaning of materials by removing surface contamination

  Examples: protective clothing,
  polyethylene sheeting,
  wooden boards used for window/door security

- the recycling of lead-based hazardous waste, as appropriate, at a lead smelter

- the removal of unpainted components from the waste stream

A named individual should administer the plan. Records should document the materials that were recycled and those materials sent to a lead smelter.

10.4.4 Selection of waste disposal firm

Since the responsibility for the hazardous waste ultimately rests with the building owner, the selection of a waste disposal firm is an important part of the hazardous waste plan. It is recommended that an environmental attorney review paperwork used by the waste transporter and the disposal facility.

By signing waste shipping forms without such review, waste generators may accept responsibility for the waste during shipment, and or hold the waste transporter free from liability in the event that there is an accidental spill. Some waste disposal site operators also receive the waste without accepting responsibility for the waste deposited in their site. In the event of a site clean-up effort, the companies whose waste is deposited there may pay for the work.

In selecting a disposal firm, the waste generator should check on the following:

- The disposal firm's Waste ID number
- The type of landfill where the waste will be deposited (lined or unlined)
- Citations by EPA or State agencies
- The type of waste the firm is licensed to handle (liquid and solid)
- The firm's experience with RCRA and land disposal restrictions
- The firm's ability to treat waste (encapsulation)

The waste disposal firm should be able to help the waste generator in complying with the packaging, labeling, and record keeping requirements of the waste disposal regulations. Waste generators should also check with other waste generators, and trade associations on the disposal firm's qualifications and integrity.

Table 10.1 Categories of Abatement Waste

Category and Description	Examples of Wastes	RCRA Requirements
(I) Low Lead Waste	Filtered personal and commercial wash water. Disposable personal protective clothing that has been HEPA vacuumed before disposal. Plastic sheeting cleaned prior to disposal (misted and wiped) and carpeting. Any waste that is determined to be nonhazardous by TCLP testing and is not an EPA-listed hazardous waste.	Manage as nonhazardous solid waste.
(II) Architectural Components	Painted finish carpentry items including doors, windows, window trim and sills, baseboards, railing, and moldings. Other painted building components including metal railings, radiators, walls, and stone or brick.	Depending onknowledge or TCLP testing results, manage as solid hazardous or nonhazardous waste.
(III) Concentrated Lead Waste	Sludge from paint stripping Lead-based paint chips and dust. HEPA vacuum debris and filter. Unfiltered wash water. Hazardous waste. An waste included on EPA's list of hazardous waste.	If more than 100 kg/month is generated, manage as hazardous waste. If less than 100 kg/month is generated, manage as solid waste.
(IV) Other Waste	Material that cannot be determined, using knowledge of the waste, to be either hazardous or nonhazardous must be tested using the TCLP.	Use TCLP to determine if waste is considered hazardous.

CHAPTER 11: PLANNING LEAD HAZARD CONTROL PROJECTS

[This chapter corresponds to ASTM E 2052, section 14]

11.1 Planning and prioritization of lead hazard control projects

The purpose of lead hazard control projects is to control or eliminate the source(s) of lead hazards. They do not include projects that are intended only to clean up lead-contaminated dust or soil without addressing the source(s). Proper planning will provide the basis for a well defined, effective, and cost efficient lead hazard control project. Planning will also assist the facility owner with prioritizing the areas that are the most hazardous and need to be addressed.

This chapter provides information for selecting a qualified contractor, consultant, and laboratory. Guidance for developing a scope of work and examples of work scopes used on lead hazard control projects are discussed. Established lead hazard control guidance documents include the NIBS specifications, NIBS O&M Manual, and the HUD Guidelines. Figure 11.1 is a flow chart representation of the lead hazard control project planning process.

Prioritizing lead hazard control projects is the first step in planning the work. Using the classification scheme suggested in this manual, the priorities from highest to lowest are listed below.

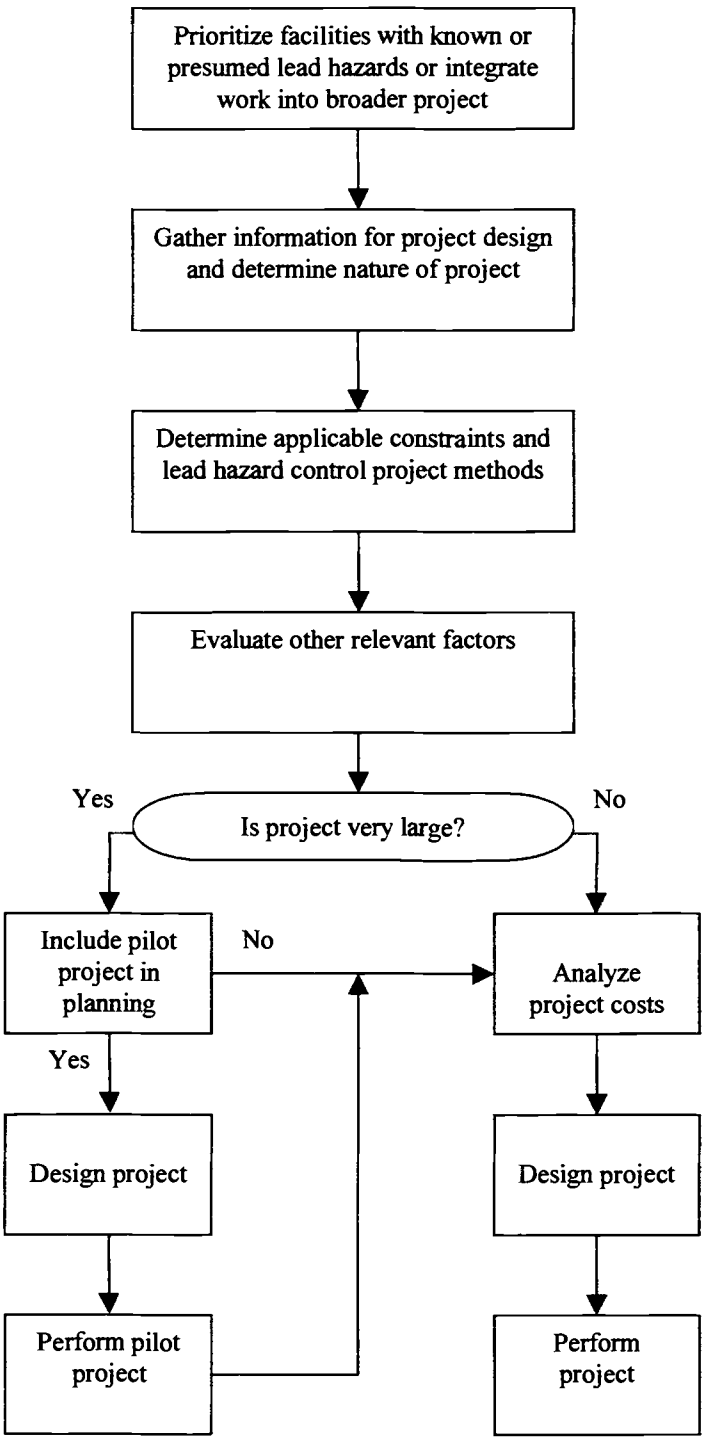
1. Facilities, buildings or units with children under age 6 or housing pregnant women.
2. Facilities soon to be occupied by children or women.
3. Class A facilities.
4. Class B facilities.

11.1.1 Child occupied facilities

Infants, fetuses, and children under the age of six have the greatest risk of becoming lead poisoned. For this reason, facilities having children younger than six years old and/or facilities housing pregnant women should be addressed as the highest priority when planning lead hazard control projects.

When planning a control option for child occupied facilities the relocation of the facility occupants and their belongings should be a major consideration. Additionally, an assessment should be performed to determine if the belongings and/or furnishings are a source of lead exposure. This being the case, a determination should be made whether the items can be decontaminated or if disposal is the only option. The building owner could retain an experienced consultant to develop a

Figure 11.1: Lead Hazard Control Project Planning



testing protocol. The consultant could also provide advice on the types of furnishings that are feasible to clean and the most effective cleaning methods.

In some instances the project designer and facility owner may need to determine if disposal and replacement of personal property is more cost-effective than decontaminating, and testing items such as drapes, fabric furniture, and carpet. Contaminated furnishings would present a high priority for hazard control as children spend a great deal of time on carpet and furnishings.

11.1.2 Class A facilities

The next criteria to be used in prioritizing lead hazard control projects is the Class A facility classification. Class A facilities are usually those built before 1960 and facilities which have known areas of significantly deteriorated lead-based paint.

It is important to understand that early Class A construction dates (pre-1950) may have a higher lead content in the paint and the components having lead-based paint may be more numerous. These facilities may require more extensive work to control or abate lead hazards. It may be useful, or in some cases necessary, for those prioritizing the Class A facilities to use sub-classifications. Chapter 5, "Collecting Information on Facilities," provides additional information on sub-classifications to further assist with prioritizing the work to be done.

11.1.3 Class B facilities

In general, Class B facilities are those built in 1960 or later, but before 1978; Chapter 5 describes the other criteria for Class B facilities. Typically, the facilities in this category have fewer components with lead-based paint. Also the lead-based paint does not have as high a lead content as that used in early construction periods. Therefore, the priority of these facilities is not as urgent as those discussed above. It is however very important that lead hazard evaluations be performed in Class B facilities, as lead-based paint was used during this construction period.

11.1.4 Other factors affecting priority of work

Other factors used to determine priority are the existing facility conditions, sources of lead contamination, elevated blood lead levels, occupant turnovers, renovation plans, and tenant relocation. Additional information for the evaluation of a facility to prioritize the hazard control project can be found in Appendix X1 of ASTM E 2052.

11.1.4.1 Existing facility condition

The quantity, concentration and condition of lead-based paints are factors which influence the overall lead hazard of a facility. A facility that has many components coated with lead-based paint would have a higher probability of having the paint damaged during normal operations or during maintenance activities. Paints that contain high concentrations of lead are more likely to produce higher levels of lead in dust generated by the paint. It stands to reason that lead-based paint that is peeling, flaking, scaling and is in generally poor condition poses a lead exposure hazard.

When planning for the control or abatement of lead hazards, it is important to consider the condition of the building and painted components. Interim controls and some abatement efforts will be temporary, at best, if the source of damage and/or deterioration is not corrected. Interim controls, encapsulation and enclosure, which leave leaded paint in place are likely to fail if sources of damage and deterioration, particularly due to moisture, are not addressed. Repairs such as roof leaks should always be included in the planning process, even if the repair is of a temporary nature.

Baseline sampling may be performed prior to beginning a lead hazard control project. The purpose of this sampling is to document the existing lead hazards or their sources. These samples are usually archived for possible later analysis should a dispute with the contractor arise.

Sampling and analyses should be performed in accordance with applicable regulations, ASTM standards, and/or NIOSH and EPA methods. The sampling and data interpretation should be performed by qualified professionals and qualified and accredited laboratories should perform analyses. Chapter 17: Sampling and Analysis Procedures provides essential information regarding various types of lead sampling and analyses.

11.1.4.2 Lead contamination sources

Sources of lead contamination can originate from both inside and outside a facility. Sources of lead exposure include emissions fallout from leaded gasoline, industrial emissions, paint from steel structures, home remedies, hobbies, household furniture, drinking water, drinking water pipes, painted toys, window blinds, and even glazes of ceramic and china dishes.

An important factor in controlling lead hazards is recognizing the source of contamination. Lead hazard control projects should control the source of the contamination, not merely the contamination itself.

11.1.4.3 EBL cases in neighborhood

Another tool for prioritizing and planning lead hazard control projects are blood lead levels. Elevated blood lead levels are an indication that exposure has occurred and is likely to continue to occur until the hazard is reduced or eliminated. If children throughout a neighborhood have exhibited elevated blood lead levels, it is possible that the source of the lead poisoning is of an environmental nature. The source could be a nearby industrial facility contaminating the air, soil, and/or water. Another option could be a specific area or activity at the school or daycare facility. All of these potential sources should have been included in the lead hazard evaluation.

The property owner or program manager typically makes decisions regarding lead hazard control options. However, in facilities housing children with lead poisoning, local authorities (typically public health, environmental control and housing agencies) and parents are included.

11.1.4.4 Occupant turnover plans

Occupant turnover is an ideal time to perform lead hazard control projects. The facility owner or manager should consider performing these projects during turnover times. The owner should carefully weigh the reduced cost and trouble of waiting for a unit to be vacated versus the potential risk of waiting.

Typically, periods of turnover include maintenance and or renovation prior to the next tenant taking occupancy. It is likely that some degree of lead related work would have to be performed during this time. The cost of including the lead hazard control project is reduced when coupled with the other work. Additionally, the lead hazard control project will be more easily managed not having to relocate a tenant(s) or protect property. These factors may play a role in establishing the priority for the control of lead hazards.

11.1.4.5 Current and future renovation plans

Prior to deciding upon a lead hazard control project or option, the future of the facility should be considered. If future plans are to demolish the building, extensive lead abatement may not be the most cost-effective option. An inspection and risk assessment with appropriate interim controls may be a better alternative. If the future plans for the facility do not include occupancy by children or pregnant women, lead hazard controls are necessary only to protect the workers performing maintenance, renovation or demolition work and the environment.

For example, scheduling the removal of painted window frames and sashes in conjunction with the planned installation of energy efficient windows is appropriate. One owner removed deteriorated painted soffits as part of planned roof replacements. The roof replacement corrected the water damage source and the soffit removal eliminated the lead hazard source.

An inspection should be done of surfaces prior to performing work that could generate lead-containing dust. Typically inspecting an entire facility at one time is more cost effective than performing multiple inspections of smaller project areas. It may also make sense to perform other lead hazard control work at this time. Performing multiple small projects under a single project may prove beneficial from both a time and budgetary standpoint.

For safety and health, as well as regulatory and contract reasons, it is important that a leaded paint inspection is performed prior to performing construction or maintenance activities. Knowing the presence of leaded paint will more clearly define the scope of the project/work and will reduce change orders. The OSHA Lead Construction Standard (29 CFR 1926.62) has specific requirements for work on materials containing detectable amounts of lead. Knowing the lead content, or absence of, will provide clear communication of the lead hazard of the work and help prevent inadvertent exposure. E 2052 recommends leaded paint characterization be performed on surfaces to be disturbed by the work.

When planning a project involving leaded paints, one should be aware that other hazards might be involved such as asbestos. In some instances it may be possible to include lead paint abatement with asbestos abatement.

11.1.4.6 Effect of tenant relocation on priority of scheduled work

Some projects require occupant relocation. Relocating the occupants and their possessions to a lead safe facility is an effective way to ensure the occupants do not enter the facility prior to the completion of the lead hazard control activity. Relocation requires a great deal of planning and coordination to insure that not only the occupants and their possessions are relocated, but that such things as mail and telephone are transferred as well. Getting to and from work and even shopping may become more difficult for the occupants. Whenever possible, children should not be transferred to different schools. This may require coordinating special transportation. These complex coordination issues may have an affect on the scheduling and priority of a specific project.

ASTM is developing a standard guide on summarizing lead evaluation and management activities into a one page notification form. When this draft document is finalized it will provide useful information for the notification of occupants

with regard to lead-based paint activities. The document is titled, *Standard Guide for Preparing Lead Hazard Evaluation and Control Activity Notices*, (ASTM E06.23.72).

11.1.5 Selection of control methods

The next step is to determine what hazard control method(s) are appropriate for the specific lead hazards identified in a facility. Hazard control methods include both long-term and short-term measures, either of which can be an appropriate selection given the circumstances of a specific facility. The selection of the proper control method(s) will vary greatly from facility to facility.

If a risk assessment has been conducted, the subsequent report will present the various options for controlling lead hazards and a rough estimate of the cost associated with each option. Table 11.1, excerpted from the HUD Guidelines, summarizes some of the most likely lead hazards and associated control options. Typically, the building owner will find that a combination of these methods is the most efficient approach to controlling lead hazards in a facility.

The two approaches for addressing lead hazards are interim controls and abatement. Interim controls are designed to control lead hazards in-place on a temporary basis as opposed to abatement methods, which remove the source of lead exposure, or create a near-permanent enclosure. A brief description of control measures and abatement methods is provided below.

- **Paint film stabilization** – Generally, this technique involves the repair of the condition that caused the paint to deteriorate; removal of the deteriorated paint; structural repair of the surface the deteriorated paint was covering (as necessary); preparation of the surface (cleaning, deglossing, neutralizing and rinsing); application of a top coat and primer; cleanup; and a clearance examination.

- **Friction and Impact Surface Treatment** – Friction surfaces are surfaces that are subject to abrasion due to normal operation or when a building component is not properly operating. Common friction surfaces include window components, tightly fitting or rubbing doors, cabinet doors and drawers, stairway treads and railings, and floors painted with lead-based paint.

  Impact surfaces are surfaces, usually protruding, that are routinely bumped or banged. Small chips of paint dislodged as a result of impact cover the floor with small amounts of loose lead-contaminated dust and chips. Doors and doorjambs, door trim, doorstops, outside corners of walls, baseboards, shoe moldings along baseboards, stair risers and chair rails are typical impact surfaces.

  The most effective lead hazard control measures for friction and impact surfaces usually involve a combination of interim control and abatement procedures.

- **Dust removal and control** – As the primary source of lead poisoning in children, the removal and control of lead dust on accessible surfaces is a priority of the lead hazard management plan. Most of the other controls, both interim and permanent, are ultimately aimed at preventing the generation and transport of lead dust from deteriorating lead-based paint, abrasion and impact of surfaces, disturbance of surfaces, and exterior soil.

  The techniques for removal of visible and invisible particles of leaded dust from surfaces include a combination of cleaning with a high efficiency particulate air (HEPA) filtered vacuum and wet cleaning with a lead-specific solution such as sodium triphosphate. Areas typically targeted for cleaning include window sills, exterior window troughs, floor/steps, carpets and upholstered furnishings, radiators, and grates and registers.

- **Lead-Contaminated Soil** – Interim controls for addressing lead-contaminated soil involve the installation of surface coverings such as grass or gravel; the erection of barriers such as fences or thorny bushes to prevent contact (land use controls); drainage controls to divert water flow away from contaminated areas; and methods to reduce dust generation such as periodic watering, creation of windbreaks, or foot traffic controls.

- **Lead in Water** – If the source of the lead contamination is the plumbing and not the water supply, the simplest way to reduce the lead is to flush the lines by letting the cold tap water run for a minute or two when the line has not been used for a six hours. If the lead source is the water supply, bottled water should be used for consumption.

- **Removal of lead-based paint** – This control method involves the use of heat guns, chemicals, or contained abrasive procedures to separate the paint from the substrate. It is the most invasive and complex control method with respect to preparation, worker protection, and implementation.

Table 11.1: Main Hazard Control Options That Could Be Identified in Risk Assessments

Treatment Option	Dust[1] on Floor	Dust[1] on Windows	Paint[2] on Doors	Paint[2] on Windows	Paint[2] on Floor and Walls	Paint[2] on Trim	High Soil Lead Levels
Dust removal	X	X	X	X	X	X	X
Paint film stabilization			X	X	X	X	
Friction reduction treatments	X	X		X		X	
Impact reduction treatments	X	X	X			X	
Planting grass	X						X
Planting sod	X						X
Paving the soil	X						X
Encapsulation					X	X	
Enclosure					X	X	
Paint removal by heat gun[3]			X	X	X	X	
Paint removal by chemical[3]			X	X	X	X	
Paint removal by contained abrasive[3]			X	X	X	X	
Soil removal	X	X					X
Building component replacement			X	X	X	X	

[1] Lead-contaminated dust
[2] Deteriorated lead-based paint
[3] Limited areas only

Adapted from Table 5.8 of the "HUD Guidelines for the Evaluation and Control of Lead-Based Paint in Housing", June 1995.

Figure 11.2: Leaded paint peeling from soffit before control.

- **Building component replacement** – The removal and replacement of building components that contain lead-based hazards is one of the preferred abatement methods because it can be done with minimal contamination of the property and exposure to workers.

- **Enclosure Methods** – Using these methods, an enclosure is constructed on the interior or exterior of a building to create an airtight barrier between the lead hazard and the environment. The installation of a rigid durable barrier is accomplished by mechanical attachment to building components and sealing of all edges and seams with caulk or paint. Enclosures should have a design life of at least 20 years.

- **Encapsulation** – Encapsulation is the application of a liquid-applied coating or adhesively bonded covering material to form a barrier between the lead-based paint and the environment. The encapsulation product system that is used should be warranted by the manufacturer for at least 20 years.

- **Soil and Exterior Dust Abatement** – Soil abatement methods include soil removal and replacement, soil cultivation (rototilling), soil treatment and replacement, and paving with concrete or asphalt.

  Exterior dust control involves the use of hand-pushed HEPA vacuum cleaners, vacuum assisted sweepers, and vacuum sweepers to remove as much dirt and dust as possible from all paved surfaces on the property. To be effective over the long term, dust removal must be accompanied by controlling sources of lead-contaminated dust.

- **Lead In Water** – Sources within a facility that are most likely to contribute to elevated levels of lead in water include lead pipe, lead solder and brass faucets and fixtures. Removal and replacement of any of these lead-containing components that come into contact with the water supply would provide a permanent means of reducing the lead content.

There are a variety of factors to consider in selecting the combination of control options that will be the most appropriate for a facility.

- Long-and short-term objectives of the Program
- Future planned use of the structures
- Degree of risk to exposing occupants to lead poisoning hazards
- Availability of funding
- Estimated cost of interim controls versus abatement
- Condition of substrates on which hazards are identified
- Amount of time that abatement will take

Figure 11.3: Soffit after metal enclosure applied

- Availability of alternative housing for displaced residents
- Estimated cost to relocate occupants prior to and after abatement
- Predicted amount of hazardous waste that may be generated
- Amount of occupant training that will be necessary to perform limited interim controls versus training of workers
- Number of skilled and properly trained in-house workers or abatement contractors that are available
- Amount of available equipment and materials

11.1.5.1 Review records and gather necessary information about building components and systems

Surfaces and components that require lead hazard control work should be identified. Existing records should be reviewed and lead-based paint characterization performed. Review available records of previous abatement, interim controls, weatherization, rehabilitation, repair, renovation, or maintenance work for information relating to the condition of building components and possible sources of lead hazards that may be exposed by new work.

Another factor to consider when reviewing a facility for the control of lead hazards is historical preservation. A property or facility may be listed on federal, state or local historical registry. Specific construction or control activities may not be appropriate or legally acceptable in the case of historical preservation. This information can typically be obtained through a local historical preservation society, a department of historical preservation, or university. An example applicable to buildings in Georgia would be the Georgia Environmental Protection Act (GEPA), which requires special consideration for any property listed or eligible for listing on the Georgia Registry of Historical Places.

11.1.5.2 Review any plans for other repair and renovation work

The program manager should review plans or needs for future weatherization, rehabilitation, repair, renovation, or maintenance work with which lead hazard control work might be integrated. Combining routine repair and renovation activities with lead hazard control is usually cost beneficial.

Figure 11.4: Removal and replacement of lead-based paint coated doors and windows

11.1.5.3 Review available control methods and evaluate each for technical applicability to the facility

An important aspect of selecting a lead hazard control method is to develop a selection procedure. Advantages and disadvantages of various methods are provided in Appendix X3 of E 2052. When selecting a hazard control method,

determine the specific area of the facility that will be involved. Depending upon the nature of the hazard, the control project could involve the entire facility or only a small portion. Identify if the project is to be an interim control, abatement, or a combination of the two.

The lead hazard manager should determine which method(s) are most appropriate under the constraints imposed by governmental regulations, immediate budget issues, and insurance/liability issues. The integrity of the structure in general or of individual components may dictate a specific method. Other factors affecting the selection of a method include the properties of facility components and surfaces, surface areas, shapes, and accessibility. Another issue may be the availability of contractors and personnel with suitable skills and experience to properly execute the work.

11.1.5.4 Cost efficiency of control methods

When choosing lead hazard control methods, consideration should be given to cost factors. The method should be reviewed to determine the lifetime cost of the option, the capital equipment costs, personnel training costs, and environmental, health, and safety costs. Cost efficiency is enhanced with proper planning and when the lead hazard control project can be coupled with other planned renovations. The future financial benefit replaced components can provide a property should not be overlooked. Replacing windows with windows that provide a higher degree of insulation can provide financial return in the form of reduced utility bills and a potential increase in the property value.

Cost estimates are composed of many elements. Primarily, the contractor will base their bid/price on labor, materials, overhead, and profit. However, many factors affect these categories. Costs will be affected by the location of the project, the time of year the project is performed, scope of the project, the amount of time in which the project is to be completed, the presence of other hazardous substances or unusual conditions, and occupancy status of the facility. The cost of the project is likely to be higher if contractors have a full workload with a comfortable backlog. The consultant or architect who is managing the project can also affect the cost of a project through their specifications and management skills.

One method of helping to budget project costs is to identify a few lead hazard control contractors (3-5) in the area. These contractors can be a valuable resource for understanding the climate of contract work. Additionally, a facility manager or owner may find that a contractor is more concerned with the quality of work and is more cost conscious when working with a repeat customer. These factors positively influence the cost efficiency of the work.

11.1.5.5 Other factors affecting selection of control methods

The process of selecting a control method involves asking and answering many questions. Below are a number of questions which should assist the lead hazard control manager with selecting a control method. Frequently this information will assist in prioritizing work and providing cost estimate/budgetary information.

- What degree of skill level is necessary to employ a method?
- How will the facility/component look after completion?
- How well suited is the method to the facility/component?
- Will the hazard continue to exist after employing the method?
- Is the method restricted by factors of weather? If so, what are those factors?
- Can the method be utilized on friction surfaces?
- How long will the method take to complete?
- What degree of worker protection is required to employ the method?
- How much finish work will be required after employing the method?
- Is the method a permanent solution? If not, how long will it last?
- What degree of effort is required to complete the method?
- Can the method be done safely in the facility/community setting?
- How much preparation is needed prior to employing the method?

11.1.5.6 Pilot projects

Pilot projects should be considered for very large and/or complex projects to determine the feasibility and effectiveness of proposed methods. The pilot project can assist with establishing requirements for worker protection, the ability of the lead abatement contractor's work to meet clearance standards and waste disposal criteria, and the suitability of the final product.

Test patches should be used to provide information regarding the use of specific reinforced and non-reinforced encapsulation products and when using chemical strippers.

11.1.6 Planning the lead hazard control project

Thorough planning should be done prior to beginning a lead hazard control project. The goal of the planning is to ensure compliance with regulations and guidelines and to ensure the project is performed efficiently while minimizing the risk of lead exposures to workers, occupants, and the environment.

For some projects, coordination with state or federal regulatory agencies may be required.

11.1.6.1 Site-specific occupant protection plan

The occupant protection plan should minimize the risk to facility occupants and visitors from lead and other hazards during the performance of the lead control project. The plan describes the procedures for protecting occupants and their belongings during the lead project. The plan should describe procedures and methods to control dust that is present at the project site; to reduce the amount of dust generated during the work; to prevent the entrainment and dissemination of dust beyond the work area; and for clean up of dust at the completion of work.

The plan should describe the methods and procedures used to isolate occupants from lead hazards during the lead project. For larger projects this will typically be accomplished by relocating the occupants to a lead-safe environment. Isolation and work area containment may be adequate for smaller-scale projects.

The plan should also address the decontamination of occupant belongings prior to relocation and for the covering and protection of belongings if they are not or can not be removed from the area. The plan should address ensuring that all belongings are lead safe prior to reentry by the occupants of the facility. Chapter 8 of the HUD Guidelines provides additional information regarding resident protection and worksite preparation. The plan should provide provisions for ensuring that appropriate work practice controls are employed and that the project site is secure to prevent unauthorized access.

11.1.6.2 Site-specific environmental, safety and health plan

A site-specific environmental, safety and health plan establishes the procedures and policies used to protect the environment, the workers, and the public. The plan should be developed in accordance with Chapter 9 of the HUD Guidelines and the applicable federal, state, and local regulations. Some of the elements an environmental safety and health plan may address are listed below. The hazards of a specific project determine the elements included in a site-specific plan.

- Identify individuals and alternates responsible for implementing and enforcing the plan. The qualifications for selection should also be stated; these persons are typically the OSHA competent person.
- Identify and describe the hazards of each operation of the project.
- Ensure that persons are adequately trained for their individual responsibilities, work and special situations which may arise.
- Identify any medical surveillance requirements.
- Specify the plan for air monitoring, environmental monitoring/sampling, and monitoring personnel. If none is needed, state this in the plan.
- Identify the methods to reduce or eliminate the release of contaminants from the project site.
- Define site security and control measures.
- Define decontamination procedures for any items exiting the work area and site. This should include personnel and equipment.
- Establish standard operating procedures (SOPs) for the site. SOPs may include site access, decontamination procedures, and respirator inspection, fit testing, and cleaning. A checklist can be helpful to document that SOPs are followed.
- Establish a contingency plan for effective response to emergencies and unplanned events. A contingency plan is typically a separate document that establishes detailed requirements and responsibilities for response to an emergency.

11.1.6.3 Materials handling and storage

Proper materials handling and storage is an essential part of a safe worksite. OSHA has specific regulations dealing with the handling and storage of materials on a construction site (29 CFR 1926.250). Maximum safe load requirements should not be exceeded when storing materials within buildings. Aisles and passageways should be kept clear to provide free and safe movement within the facility. Non-compatible materials should be segregated. Materials should not be stored on scaffolds or runways in excess of the supplies required for immediate use. Used or removed lumber should have nails removed prior to stacking/storing. Regulations regarding materials handling and storage should be consulted and incorporated into the site specific safety and health plan for the project.

Lead wastes should be properly packaged, labeled and stored in a secure location. Typically a covered, lockable drum or dumpster is an effective method of storing waste prior to disposal.

11.1.6.4 Applicable codes, regulations, and guidance

It is the responsibility of those performing and managing the lead hazard control project to be familiar with and comply with all applicable codes and regulations. Much research and guidance has been published to assist these entities in this effort.

Various codes, regulations, and guidance directives may apply to any given control method or option. Factors determining which regulations apply to a specific project or control method include the control method used, the facility in which the work is being done, the entity performing the work, and the part of the country in which the work is performed. Be aware that various states and local governments have enacted standards, which are more stringent than the federal standards.

Chapter 2 of this manual and section 2 of ASTM E 2052 entitled Referenced Documents provides information on ASTM Standards, U.S. Laws and Regulations, and Government Agency Guidance. The user should be aware that these documents are periodically updated and it is the responsibility of the user to ensure that the most current version of each document is used.

11.1.6.5 In-house versus contracted work

The facility owner may have the option of performing lead hazard control projects in-house. The factors determining if in-house personnel can perform control projects are regulatory compliance, and degree of training, resources, and experience. Some states mandate that lead hazard control be work performed by individuals licensed in the state. In this instance it may be possible for the facility owner to obtain a license to conduct the activity. With the possible exception of very large facility owners, this option may not be cost-effective.

11.1.7 Lead hazard control project management

Managing a lead hazard control project involves the supervision of the project to ensure that the project is completed on time, within budget and has accomplished the goal(s) of the project as directed by the project specifications. The lead hazard control program manager typically performs this function for in-house projects. Larger projects can be managed internally or by a consulting engineer, architect, industrial hygienist, or other safety professional. In some instances the firm or entity managing the project will perform the inspection of lead-based paint and hazard assessment, assist with setting priorities, and provide input for the selection of control options/methods. Additionally, the project manager may prepare the project specifications, conduct the bidding solicitation and bid review, as well as the overall management of the project.

11.1.7.1 Project schedule and timeline

A detailed schedule should be developed for each task necessary to complete the lead hazard control project. These items include the development of the project scope of work; solicitation for bids; contractor selection; identifying a lead safe facility for relocation; notifying the tenant of planned work and/or relocation; the actual act of relocation; etc. A timeline should be attached to the schedule identifying a specific period of time to complete each task. To the extent feasible, all lead work should be completed before non-lead work begins. It is important to develop a realistic timeline. An unrealistic timeline could adversely affect the project from both a cost and quality standpoint.

11.1.7.2 Management procedures

Procedures for the management of a lead hazard control project are provided in the HUD Guidelines, NIBS Specifications, and Corps of Engineers Specifications. Typically a lead hazard control project manager represents the facility owner. The specific management responsibilities and procedures should be identified prior to the commencement of the project. Project management procedures and responsibilities include, but are not limited to the following:

- Managing the project to ensure quality control

Figure 11.5: Lead hazard control projects are frequently coordinated with renovation activities

- Reviewing and approval of work areas and controls
- Reviewing of monitoring data
- Submitting data
- Documenting work progress
- Monitoring compliance with specification and contract documents
- Responding to specific site conditions which may vary from contract documents
- Documenting incidents pertaining to project completion and advising parties (owner, architect, contractor) of appropriate resolutions
- Verifying completion of work tasks/segments
- Administration of project progress, safety, and budgetary meetings
- Insuring abatement is complete
- Identifying daily and final punchlist items
- Conducting project close-out

11.1.7.3 Trouble shooting and responding to incidents

A key element of effective project management is the resolution of problems that arise during the course of the project. An example may be discrepancies between the project specifications and project drawings, or difficulties with performing a hazard control method as specified. Another aspect of effective project management is the ability to respond to incidents during the project, which may adversely affect the health and safety of those in or around the project site. For this reason each person designated as a "Competent Person" (as defined in the OSHA Lead Construction Standard - 29 CFR 1926.62) should have the authority to respond to unsafe or unhealthful conditions. The Competent Person should have the authority to stop the activities creating the conditions, and have the ability to eliminate the hazard. When situations such as these arise, they generally involve time and/or money, which could lead to a change order. In this respect, the project manager is representing the building owner, and the abatement contractor should regard the project manager's direction as authoritative and binding.

11.2 Coordinating Lead Hazard Control Projects

Lead hazard control projects should be coordinated to include all lead hazard control work in a facility rather than performing separate projects for the encapsulation of window components and a separate project to enclose walls and ceilings. Likewise, a project involving the enclosure of exterior siding may include the replacement or encapsulation of window components. The cost and disruption to tenants will be considerably less if these activities are completed as one project.

11.2.1 Lead control projects in conjunction with other work

From a practical standpoint and in an effort to improve cost effectiveness, lead hazard control projects should be performed in conjunction with other projects. In many instances it may be necessary to perform some abatement or interim control to provide a safe work place for those performing the work.

11.2.2 Relocation of occupants

Occupants should not be allowed to enter a lead hazard control work area at anytime during the performance of the work. This should be a requirement regardless of the extent of the work. Even though the occupants may not enter the work area, they may not necessarily have to be relocated from the facility. An occupant may remain in the dwelling or facility during a project involving the removal of dust or any interim control or abatement method disturbing less than 10 square feet of painted surface per room, which does not take longer than one day. The occupant should be provided lead safe access to a restroom, a living area and passage to enter and exit the facility. Alternatively, the occupant could leave the facility during the duration of the work.

An occupant should remain outside the facility or dwelling if a project involves the removal of dust or any interim control or abatement method disturbing less than 10 square feet of painted surface per room, which extends longer than one day but no more than five days. In this instance the occupant may return each day after the work is complete and the area has been cleaned-up. Again the resident should be provided lead safe access to a restroom, a living area and means of entry/egress. Another option under this scenario would be to relocate the occupant until the work has been completed.

An occupant should be relocated outside the facility or dwelling and not allowed to return until the work and clearance is received for any project involving abatement or any interim control method on more than 10 square feet of painted surface per room.

An occupant may remain inside a dwelling or facility during the performance of any interim control or abatement method disturbing less than 10 square feet of exterior painted surface, soil control activity, or window treatment or replacement lasting no more than one day. The occupant should not be allowed to leave until the work and clean up is complete, or only if lead safe access is provided.

Occupants should be relocated from the facility or dwelling if a project involves soil control methods or the disturbance of 10 to 50 square feet of exterior painted surface during the performance of any abatement or interim control option. The

occupant may return to the unit at the end of each day's work after clean-up is performed.

Occupants should be relocated from the unit to a lead safe environment during work involving any abatement or control method disturbing more than 50 square feet of exterior painted surface, or soil activity. The occupant should not be allowed to return until all work is complete and final clearance has been obtained.

Permanently relocating a family from their home may in some cases be the only option to control the lead exposure hazard. Permanent relocation may be appropriate when a family lives in an area when the exposure source is of an environmental nature. This could include lead emissions from an industrial operation, which provides a source of exposure, that can not or has not been reduced to acceptable levels, or when naturally occurring lead is present in the soil. Another example when permanent relocation may be appropriate is in the event a lead exposure hazard is recognized but can not be controlled due to the lack of resources.

11.3 Qualification and Selection of Contractors

Qualification procedures are intended to ensure that companies and their personnel are competent to maintain the quality of program functions. They are also intended to ensure compliance with applicable lead hazard control regulations. Qualified contractors should have the appropriate qualifications to perform the specific hazard control method. This qualification should be evident not only for the principle(s) of the company but also for those performing work. Qualifications of personnel include initial training and refresher training which meets the applicable regulatory requirements of the work they perform. Professional organizations provide an avenue for staying current with changing regulations, technology, and advancements in a field. Key personnel of qualified contractors should have affiliations with appropriate professional associations. Contractors should be qualified to perform the work prior to soliciting a bid to perform the work.

11.3.1 Licensed or certified contractors

EPA has established regulations requiring certification of lead abatement contractors (40 CFR 745). Some states (not all) are requiring contractors to obtain a license to perform lead hazard control activities. Contractors operating in states without licensing regulations are required to be certified by the EPA or be licensed in another state in order to perform lead hazard control work. Licenses, accreditations, and certifications should be verified prior to contracting with an organization or firm.

11.3.2 Selection procedure based on ASTM Practice E 1864, or other recognized methods

The selection procedure used to qualify a lead hazard control contractor should be based on established qualification procedures. ASTM has established qualification procedures in their E 1864 standard entitled, *Practice for Evaluating Quality Systems of Organizations Engaged in Conducting Facility and Hazard Assessments to Determine the Presence and Extent of Lead in Paint, Dust, Airborne Particulate, and Soil.* This standard covers the quality system requirements, competency and qualifications of organizations engaged in providing lead assessment services. While this standard addresses the qualifications and requirements for the selection of consultants for lead work, the evaluating practices for the quality systems can be applied to contracting entities as well. Additional specific criteria for selecting a qualified lead hazard control contractor is provided in the following publications and described in chapter 4.

- SSPC-QP 2 Standard Procedure for Evaluating the Qualifications of Painting Contractors to Remove Hazardous Paint
- SSPC-QP 4 Standard Procedure for Evaluating the Qualifications of Contractors Disturbing Hazardous Paint During Demolition and Repair Work.
- NIBS Guide Specifications for Reducing Lead-Based Paint Hazards.

11.3.3 Pre-qualification procedures

In an effort to obtain a quality job, building owners should hire experienced licensed or certified contractors with certified supervisors and workers. An improperly performed project can create a greater concentration of lead dust and could possibly disperse lead dust to areas not previously affected. Pre-qualification procedures should be established to identify contractors capable of performing a specific job in accordance with 40 CFR 745, applicable state and local regulations, HUD Guidelines, E 2052 Appendix 7.1 and other documents and specifications with similar stringent procedures. Appendix X2 of ASTM E 2052 provides a list of factors that may be useful in pre-qualifying contractors.

11.3.4 Qualifications and selection of consultants

Consultants can be a valuable resource for a building owner when dealing with lead hazard control issues. Consultants, like contractors and laboratories, should have the necessary experience and qualifications to perform the work. Consultants may perform a number of duties in the course of implementing a lead hazard control program. Some of the

duties a consultant may perform include training, conducting lead-based paint inspections, conducting lead risk assessments, developing management plans and programs, preparing contract documents, selecting laboratories, contractors, and waste transporters, lead hazard control project management and monitoring, and performing ongoing monitoring and reassessments. It may be in a facility owner's best interest to use different consultants that have expertise in different areas. For example, one firm may be recognized for their training expertise, another for inspections and assessments, and yet another for lead hazard control project management. Consulting firms and their key personnel should be qualified on the basis of their documented competence and compliance with quality criteria. Consultants should be selected in a manner consistent with the procedures in ASTM Standard E 1864 and as discussed in chapter 4.

Guidance on consulting firm selection methods can also be found in Chapter 2 of the HUD Guidelines, National Society of Professional Engineers guidance, American Consulting Engineers Council guidance, and American Institute of Architects guidance. Additional information regarding selection criteria for consultants is available in Appendix X2 of ASTM Standard E 2052.

11.3.5 Qualifications and selection of a laboratory

The process of assessing lead hazards and selecting appropriate control options relies heavily on analytical data. The intent of using qualified laboratories is to ensure that quality sampling and analytical data is obtained to support decisions. Qualified laboratories should be accredited under the EPA National Lead Laboratory Accreditation Program (NLLAP). Prior to using a laboratory, a copy of the laboratory accreditation should be obtained and verified with the appropriate accrediting organization. The American Industrial Hygiene Association (AIHA) and the American Association for Laboratory Accreditation (A2LA), are currently approved accrediting organizations. A list of accredited laboratories in specific areas of the United States can be obtained by contacting these organizations.

- AIHA (703) 849-8888
- A2LA (301) 670-1377

Analyses for the determination of hazardous waste should be performed by a laboratory accredited by a nationally recognized laboratory accreditation organization.

11.4 Scope of Work

The project designer defines the scope of work by clearly stating the nature of the work, quantity and location of materials and task(s) for completion of the lead hazard control goals and objectives. Scopes of work can be utilized in different ways depending upon the project.

Small projects typically involve only one contractor and the duration of the project is not extensive. An example would be the replacement of a single window. The scope of work will be used to identify each task necessary for completion and may prescribe the methods to be used in lieu of detailed plans and specifications.

A scope of work used for a large multiple facility, multiple contractor project presents the nature of the work, quantity and location of materials and tasks for completion of the hazard control goals and objectives. This information may be presented in tabular form or similar list. The fashion in which the work is completed is presented in comprehensive specifications and drawings.

In either case the scope of work or specifications should establish clear physical boundaries between lead hazard reduction work and general renovation, remodeling and/or demolition activities. As an example, when lead hazard control work and general construction work are performed concurrently, the scope or specification should state what additional air sampling may be necessary to monitor exposure to workers performing the non-lead work.

The designer should consider applicable federal, state and local codes, which may affect the installation or alteration of building systems or components. An example would be any requirements to install fire protection systems or upgrades or alterations required by the Americans with Disabilities Act.

11.4.1 Performance-based and/or prescriptive-based scopes of work

A scope of work or specification may present the work in two basic formats. One is a prescriptive scope, which explicitly details the step-by-step instructions for completion of the work. This method of presentation is also known as "means and methods" scope or specifications. When presenting the work in a prescriptive fashion, it is the designer's responsibility to ensure that the prescribed methods are effective in accomplishing the goals of the work. The responsibility of the contractor is to perform the work correctly and as prescribed. When using prescriptive scopes of work the contract documents should provide a way in which the contractor can suggest alternative ways of completing the work. In this way the contractors knowledge of work practices and technologies can be utilized. These alternative methods may provide for a more productive, cost effective, and safe project.

The second way in which a scope of work can be presented is known as performance-based. A performance-based scope or

specification is one where the contractor is told what the end result should be, but does not prescribe the exact methods or steps by which to accomplish the work.

Most contract documents will utilize a combination of both performance-based and prescriptive-based scopes of work.

11.4.2 Coordination meetings

Coordination meetings should be conducted at the beginning and throughout the project. The meetings should be attended by the general contractor, lead hazard control subcontractor (any other appropriate subcontractor), owner and/or tenant representative, and project manager. Minutes of the meetings should be taken by a clerk or specified entity to record the information discussed. The minutes should be made part of the project record and accurately document contract changes or interpretations, alterations of the project schedule, and other events or decisions pertaining to the performance and completion of the project. The minutes should be distributed to the attending parties to allow for any clarifications or disagreements with the minutes to be resolved. Project construction meetings, at a minimum should be held weekly at a mutually convenient time to all parties.

11.4.3 Methods and materials

The scope of work may set forth the methods and materials to be used by the contractor. The extent of description for the project will depend largely on whether the contract documents are prescriptive or performance-based. For prescriptive-based format, this section would include the step-by-step methods, tools, equipment and materials used. For performance-based documents, this section should describe the methods and materials that are prohibited on a project. An example may be that chemical strippers containing methylene chloride are not to be used at anytime on the project.

11.4.4 Work schedules

The work schedule defines the order in which work should be addressed. If the project involves multiple phases, each phase should be defined. Lead hazard control work should be scheduled for completion prior to work involving non-lead related activities.

11.4.5 Occupant relocation, as needed

The situations when occupant relocation is appropriate are discussed earlier in this chapter. The scope of work should identify the duration of the relocation and the methods to be performed prior to re-occupancy. The scope should also determine who is responsible for physically relocating the occupant's belongings and returning them to the facility.

11.4.6 Clear definition of the work

The scope should clearly define the work. For example, when the scope of work includes enclosing a column, the designer should clearly define what constitutes an appropriate enclosure. Well-defined scopes of work and specifications will produce comparable bids. Conversely, loosely written scopes generally tend to raise bids and increase the likelihood of expensive change orders.

11.4.7 Use of drawings to define work

Drawings are a useful way to define work. Drawings can be used to illustrate the precise boundaries of work areas, locations of decontamination facilities, locations of exhaust units, and locations to construct lead-safe access to various locations within a facility or means of egress. When a scope of work or specification includes drawings, they are considered part of the contract documents. The contract documents should clearly direct the user what do to in the event there is a discrepancy between the drawings and the specifications. As a rule of thumb, the most stringent and/or most protective applies.

11.4.8 Protection of surfaces and components

The scope of work should identify which surfaces and components to protect during the performance of the work. Prescriptive specifications should be used for protecting certain types of surfaces, components, or equipment. The designer should consider prescribing the methods to remove computers from the work space. Provisions providing sufficient ventilation for cooling of an electrical component should also be included.

11.4.9 Defining the performance period and hours available for work

The contract documents should define the length of time to perform each phase of a project. The designer should state hours of the day and the days of the week the work can be performed. The work schedule will be determined by such things as the urgency of the work, the hours of the day when the facility will be vacant and the disturbance the work may cause to persons in surrounding facilities or dwellings.

For work of an urgent nature, the designer may decide that a seven-day per week, twenty-four hours per day schedule is required to complete the work. Work that is performed on a personal dwelling which involves a small amount of lead material, requiring only a few hours, may best be scheduled during normal business hours when the occupants are at work and school. Work being performed in a day care environment would likely be scheduled for nights or weekends when the occupants are not in the facility.

11.4.10 Responsibilities of various parties

Responsibilities of each party involved in the project should be detailed. Each party should have a representative at meetings where decisions and interpretations are discussed. The contract documents should identify those who have the authority and responsibility to order work to be stopped. In the event of work stoppage, a clear-cut plan of action should be in-place. The action plan should include notification of all project representatives and, if applicable, regulatory agencies.

Another frequently overlooked item of responsibility is utilities. The contract document should define who is responsible for supplying water, electrical, heat, phone services, and possibly even office space.

11.4.11 Notifications and permits

The submittal of project notifications and obtaining building permits are often required for lead hazard control projects. The scope of work or specifications should identify the party responsible for providing appropriate notifications to the applicable federal, state, and local agencies. Typically, the contract documents place this responsibility with the contractor. Additionally, the contractor is responsible for the payment of any application or notification fees.

11.4.12 Replacement materials

Typically a lead hazard control project includes the replacement of items or materials removed during the course of a project. Acceptable replacement materials should be identified in the scope of work. Prohibit the use of lead-containing materials and find substitutes for hazardous materials in other applications whenever feasible. Salvaged materials should not be used for replacement.

11.4.13 Inspection of the work

To ensure the work is being completed in compliance with the contract documents inspections should be performed. The scope of work or specifications should state whom and at what intervals inspections of the work should be made. The scope of work or specifications should also identify procedures to correct any discrepancies.

11.4.14 Clearance criteria

Clearance criteria refer to the procedures used to evaluate completion of a lead hazard control project. The clearance criteria should determine if the work has been completed as specified, to determine if the area is safe for entry by unprotected workers, and if the area is safe for re-occupancy and use of the residents of the dwelling. Criteria for clearing a work area for re-occupancy should be specified in the contract documents. The clearance criteria should be based on the applicable guidance and regulatory requirements established by HUD and EPA for the work performed.

11.4.15 Site security

Security of a site and work area should be maintained at all times from the beginning of the project until the unit/facility is returned to the owner. In some cases security can be maintained by locking the door to the facility. However, it may be necessary to install temporary barriers for components that have been removed, such as windows and doors. For other projects, such as outside work, it may be necessary to erect a fence and/or have around the clock security posted at the site.

11.5 Standard treatments of HUD lead based paint task force report

The HUD Lead Task Force Report provides owners of rental properties with units, considered as high priority for lead hazards, an alternative to performing risk assessments and hazard control. Standard treatments are routine procedures intended to reduce hazards from lead-based paint. (See Figure 11.3) These procedures may not adequately address the potential hazards from non-LBP leaded paint. Standard treatments can be performed by maintenance personnel trained to address lead-based paint hazards. The training recommended for those performing standard treatments is presented in the HUD Task Force Report Exhibit 3-2, entitled Essential Maintenance Practices for Property Owners.

It is important to protect occupant possessions when standard treatments are performed. Standard treatments are typically performed only on surfaces that are accessible to occupants. After the performance of standard treatments in a unit, the focus of subsequent treatments is to preserve the initial work. Research is continuing for treatments of wall-to-wall carpeting, interior windowsills with intact paint, and windows with intact lead-painted components. Although it is recognized that these components may be a source of lead exposure, the HUD task force has not provided recommendations for standard treatments of these components at this time. HUD recommends that when hazards are presented by these components they should be properly controlled.

Due to the potential hazards to young children in units with low turnover, relocating a family to a treated, lead-safe unit may postpone the need for standard treatments. Property owners may consider this option when families are in agreement and comparable units are available.

Figure 11.3 HUD Task Force Report Standard Treatments

- Safely repair deteriorated paint
- Provide smooth and cleanable horizontal surfaces
- Correct conditions in which painted surfaces are rubbing, binding, or being crushed that can produce lead dust (unless the paint is found not to be lead-based paint)
- Cover or restrict access to bare residential soil (unless it is found not to be lead-contaminated)
- Specialized cleaning
- Perform sufficient dust tests to ensure safety

11.5.1 Frequency of standard treatment procedures

The HUD Task Force Report specifies minimum frequencies for performing standard treatments to maximize effectiveness of hazard control. Standard treatments should be performed each time a unit is turned over to new tenants, unless treatments were performed in the previous 12-month period. HUD further recommends that standard treatments be performed at 18-month intervals when occupied by a family with children under the age of six years. Standard treatments should also be performed in units with extensive amounts of deteriorating paint. HUD defines extensive deterioration as greater than five square feet of deteriorating paint per room. The frequencies in which standard treatments are suggested are minimum guidelines.

11.5.2 Horizontal surfaces

Lead dust that is trapped in rough, pitted and otherwise porous surfaces can not be cleaned effectively. One standard treatment is to provide smooth horizontal surfaces on floors and windowsills to maximize the effects of cleaning. It may be necessary to resurface floors with polyurethane, replace worn sheet flooring, and/or treat windowsills to provide a smooth surface.

11.5.3 Enhancement of paint integrity

An effective way to minimize exposure to lead dust is to reduce or eliminate the generation of the dust. Paint integrity should be maintained on lead-painted surfaces by correcting components that generate dust by acts of friction or contact. The owner should be aware that re-hanging or re-working binding windows and providing door stops may be necessary to reduce the friction or contact which produces lead dust.

11.5.4 Residential soil

Soil around residential dwellings is considered a hazard only when it is lead containing and is bare. When performing treatments, owners should inspect for bare soils and correct to prevent exposures. Typical treatments to reduce exposures from bare soils are to cover with mulch, asphalt, sod, gravel or other materials that will prevent contact.

11.5.5 Specialized cleaning

Children are typically exposed to lead dust through hand-to-mouth contact. Owners should employ specialized cleaning procedures when conducting treatments. Specialized cleaning procedures utilize wet wiping and HEPA vacuuming to remove the lead-dust, which is invisible to the naked eye. Section 4 of the HUD Guidelines provides additional information on specialized cleaning procedures.

11.6 Specifications for the work

Project specifications are a set of site specific documents and sometimes drawings used to present the nature, scope, and extent of a project. There are two basic formats of specifications. One a prescriptive specification (some times referred to as means-and-methods specifications) provides step-by-step procedures for the completion of the work. When prescriptive specifications are used it is the duty of the contractor to perform the methods as presented; the designer is responsible for the effectiveness of the methods prescribed.

The second format for specifications is a referred to as performance specifications. Performance specifications do not prescribe the method to be used to complete the project, rather, they present what must be performed for completion of the project. Typical project specifications utilize both prescriptive and performance methods.

Specifications are useful on large projects to prevent confusion and aid in the completion of the project. Specifications may not be necessary for smaller projects. A detailed scope of work may adequately present the relevant information to satisfactorily complete the work.

11.6.1 Existing guidance documents and standards

Existing guidance documents and standards are useful when developing specifications for a project. Specific methods and procedures are available for performing lead hazard control projects on various components under varying conditions. These guidance documents and standards may contain a large collection of procedures, although many may not be applicable to the specific project under consideration. It is important to remember that existing guide specifications and documents should be tailored to the site-specific needs of a given project.

11.6.1.1 NIBS specifications

The National Institute of Building Sciences has developed a guide specification that can be used to prepare site specific project specifications for lead-based paint hazard control projects. The guide specifications cover interior and exterior projects involving the removal of components coated with lead-based paint, lead-based paint encapsulation, lead-based paint enclosure, lead-based paint removal, and work contracted for the interim control of lead-based paint. When using guide specifications, it is important to edit the document to address the specific criteria for the project.

11.6.1.2 NIBS Operations and Maintenance Manual

The National Institute of Building Sciences has developed a manual to be used in homes and buildings when performing operations and maintenance work (O&M) involving lead-based paint. This manual is more appropriate for maintenance projects rather than lead abatement projects. The procedures presented in the manual will assist the user to control lead-contaminated dust from being generated, control the distribution of the dust, effectively clean up lead-contaminated dust and debris generated by the work activities, and protect the health and safety of the worker and those utilizing the facility.

11.6.1.3 Corps of Engineers specifications

The Corps of Engineers (CoE) have developed a set of guide specifications for use during the construction and renovation of facilities on military installations. The CoE guide specifications are similar in composition to the NIBS specifications, except they address the standards, regulations, and special situations specific to military construction.

11.6.1.4 HUD Guidelines sample specifications

Appendix 7.3 of the HUD Guidelines provides an example of a detailed lead-based paint abatement specification for use on a large public multi-family housing development. The specification provides assistance when developing specifications for work of this nature. The provisions and level of detail of the HUD example specification may not be suitable for use on lead-based paint hazard control projects in other facilities under different situations.

11.6.1.5 Other guidance (e.g., SSPC)

The Steel Structure Painting Council (SSPC) has developed guidelines for facility owners, contractors, and persons developing project specifications. Applicable guidelines pertain to paint application, removal of hazardous paints and the control of dust and debris. The SSPC guidelines focus on steel structures such as bridges and water tanks.

11.6.2 Control measures

Control measures are used to reduce or eliminate the hazards from lead-based paint. Interim control methods are used to make facilities and dwellings lead-safe by temporarily controlling the hazard. Interim control methods need to be continually maintained and require careful monitoring and periodic reevaluation by a certified professional to ensure they continue to be effective.

Abatement is the only permanent control method. Abatement can be accomplished by either removing the lead-paint from the surface or replacing the component to which the paint is applied.

11.6.2.1 HUD Guidelines

The *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* was developed by the Department of Housing and Urban Development (HUD) to assist property owners, contractors, and governmental agencies reduce lead-based paint exposure hazards to children. The "HUD Guidelines" provide comprehensive, detailed technical information on identifying, evaluating, and controlling lead-based paint hazards in a cost-effective manner. The HUD Guidelines can be obtained for a handling fee by contacting HUD USER at 1-800-245-2691.

11.6.2.2 Applicable ASTM standards

The American Society for Testing and Materials (ASTM) is a not-for-profit organization, which provides an avenue for those with common interests (producers, users, consumers, and governmental and academic representatives) to meet and develop standards for materials, products, systems, and services.

In the area of lead hazard control, ASTM has developed the *Standard Guide for the Selection of Lead Hazard Control Methods for Identified Risks in Residential Housing or Other Properties Frequented by Children.* Other ASTM Standards for use when planning and specifying lead hazard control projects are listed below:

- **E 1553** Standard Practice for Collection of Airborne Particulate Lead During Abatement and Construction Activities
- **E 1583** Standard Practice for Evaluation Laboratories Engaged in the Determination of Lead in Paint, Dust, Airborne Particulates, and Soil Taken from and Around Buildings and Related Structures

- **E 1605** Standard Terminology Relating to Abatement of Hazards from Lead-Based Paint on Buildings and Related Structures
- **E 1727** Standard Practice for Field Collection of Soil Samples for lead Determination by Atomic Spectrometry Techniques
- **E 1728** Standard Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques
- **E 1729** Standard Practice for Field Collection of Dried Paint Samples for Lead Determination by Atomic Spectrometry Techniques
- **E 1796** Standard Guide for Selection and Use of Liquid Coating Encapsulation Products for Leaded Paint in Buildings
- **E 1908** Standard Guide for Sample Selection of Debris Waste from a Building Renovation or Lead Abatement Project for Toxicity Characteristic Leaching Procedure (TCLP) Testing for Leachable Lead (Pb)
- **E 1864** Standard for Evaluating quality Systems of Organizations Engaged in Conducting Facility and Hazard Assessments to Determine the Presence and Extent of Lead n Paint, Dust Airborne Particulate, and Soil In and Around Buildings and Related Structures
- **E 1973** Provisional Standard Practice for the Collection of Surface Dust by Air Sampling Pump Vacuum Technique for Subsequent Lead Determination
- **E 2052** Standard Guide for Identification and Management of Lead Hazards in Facilities

ASTM standards may be purchased by contacting ASTM at (610) 832-9500 or through the Internet at www.astm.org.

11.6.3 Encapsulation and enclosure

Encapsulation is a control method which is relatively easy to perform for large surfaces such as walls and ceilings because of the potential ease of containment, cleanup, and protection of adjacent areas and units. Encapsulation provides a cost-effective option for lead hazard control although the long-term effectiveness is not known and currently under study. Properly performed encapsulation should, however, protect facility occupants from the hazards of lead for the period of time in which they occupy a specific unit. In order to extend the useful life of an encapsulant, it is suggested that only encapsulants with a 20-year manufacturer warranty be used.

11.6.3.1 ASTM standards E1795 and E1797 for selection of encapsulation products

The ASTM E 1795 *Standard Specification for Non-Reinforced Liquid Coating Encapsulation Products for Leaded Paint in Buildings* should be consulted when specifying encapsulation as a control method. The E 1795 standard applies to all non-reinforced liquid applied encapsulation products designed to reduce exposure to lead paint hazards. The standard is specific to encapsulation products, which rely primarily on adhesion for attachment to the surface. This ASTM standard provides minimum material performance requirements and laboratory test procedures for single and multi-layer non-reinforced liquid coating encapsulation products. This specification does not address when the non-reinforced liquid encapsulation system should be used and it does not provide guidance on which product should be used. The focus of the Standard is to determine if the encapsulation product selected is performing up to the minimum performance and laboratory test procedures.

The ASTM E 1797 *Standard Specification for Reinforced Liquid Coating Encapsulation Products for Leaded Paint in Buildings* should be consulted when specifying reinforced liquid coating encapsulation. The E 1797 standard provides the same type of performance testing and laboratory testing information as the E 1795 standard, except the procedures are developed for use on the reinforced encapsulation products.

11.6.3.2 ASTM standard guide E1796 for application of encapsulants

When employing encapsulation as a control method, the ASTM E 1796-96 *Standard Guide for Selection and Use of Liquid Coating Encapsulation Products for Leaded Paint in Buildings* provides specific direction for application. The standard provides those individuals employing liquid encapsulants, which rely primarily on adhesion for attachment to the surface, with assistance in selecting an appropriate encapsulation product. The standard also provides direction to determine if a painted surface is suitable for encapsulation, direction in the application of liquid encapsulation products, direction in evaluating the surface after the application of the encapsulation product, and guidance in maintaining the encapsulated surface.

The standard is not all inclusive and should not be used as a training aid for selection, application, and maintenance of the encapsulation system. Rather the standard provides information to supplement the information provided by the manufacturer of the specific encapsulation product under review.

11.6.4 Plumbing fixtures and solder

Plumbing fixtures and solder may be a source of lead exposure to be addressed when developing lead hazard control specifications. The focus of controlling hazards from plumbing fixtures and solder is typically one of abatement. This is generally performed by removing leaded pipes, corroding fixtures, and replacing soldered joints. When addressing these specific types of lead hazards it is important

to investigate the extent of the leaded pipes and solder joints. Abating these items in the home may not be an adequate means of controlling the hazard if the leaded pipe extends to the main water supply line or beyond. Additionally, the designer should be concerned with other safety and health hazards that may arise when performing work of this kind. For example, trenching and shoring may be an issue when removing and replacing buried water lines.

11.6.5 Replacement materials

During specification preparation, the project designer should consider what materials are acceptable to replace the materials that are being removed. One scenario may be that the facility owner wants the least expensive windows and doors available as their plans are to sell the facility and they wish to accomplish the lead hazard control work with the least amount of funds possible.

Another situation may be that the designer and facility owner may decide that the only acceptable replacement windows and doors are those with the highest insulation factor. They have determined that the components would pay for themselves after a number of years of energy savings.

Specifications for replacement materials should always state that materials containing lead, asbestos or other hazardous materials should not be used.

11.6.6 Waste disposal

The EPA regulation, Identification and Listing of Hazardous Waste (40 CFR 261), affects the disposal of LBP and components coated with LBP. In part, a material is determined to be hazardous waste if it exhibits one or more of the characteristics which define hazardous waste. The characteristics are ignitability, reactivity, corrosivity, and toxicity. For lead the only characteristic of concern is toxicity. Representative sample(s) of the waste streams are submitted for analysis by the Toxicity Characteristic Leaching Procedure (TCLP). The TCLP is designed to determine the mobility of lead in the waste. If the waste is determined to leach greater than or equal to five milligrams per liter lead, the waste is determined to be hazardous waste.

The ASTM E 1908 *Standard Guide for Sample Selection of Debris Waste from a Building Renovation or Lead Abatement Project for Toxicity Characteristic Leaching Procedure (TCLP) Testing for Leachable Lead (Pb)* may be a source to consult when collecting TCLP samples from large waste streams.

CHAPTER 12: PERFORMING LEAD HAZARD CONTROL PROJECTS

[This chapter corresponds to ASTM E 2052, section 15]

12.1 Lead Hazard Control Project Management

Lead hazard control projects are designed and performed to control or eliminate lead hazards. Poorly managed projects can create new hazards or significantly increase existing hazards. When performed correctly, projects will be completed on time, within budget and achieve the desired results.

12.1.1 Project schedule and time line

A project schedule and time line should be established at the start of every project. The schedule is a list of specific tasks that need to be performed and the order in which they need to be completed. A time line depicts these tasks on a chart showing the start and completion dates for each task.

When planning the lead hazard control project schedule every attempt should be made to minimize tenant disruption and exposures. For example, lead hazard control activities might be performed in the daytime when most residents are at work. The timeline, in relation to other non-lead activities that might occur at the work site, should be constructed to minimize the amount of work by non-lead workers requiring personal protective equipment for lead.

The time line and schedule should be reviewed weekly during the course of the project and the schedule and time line adjusted accordingly.

12.1.2 Management procedures

Each project should have a representative of the facility owner serving as the project manager. This person has the responsibility and authority to make decisions on behalf of the owner. He or she will also coordinate the work of the different involved parties. On a typical project this will include the lead abatement contractor, consultant, occupants (leasing manager), and other contractors performing non-lead work.

Clear lines of communication should be in place at the start of the project. Representatives of each involved party (owner, contractor, consultant) should attend and participate in a pre-construction conference and weekly progress meetings. Records of these meetings should be retained on file. The project manager, or representative, should maintain oversight of the project, but not interfere with the contractor's work. On some projects this is a fine line.

12.1.3 Trouble shooting and responding to incidents

Properly managed lead control projects anticipate possible problems and develops plans for addressing problems as they arise. Plans for what to do in the event of a fire, medical emergency, or lead contamination beyond the containment area should be in place before the work begins.

Once a project is underway, every lead project must have a person designated under OSHA regulations as a "Competent Person". This person has the authority to respond to unsafe or unhealthy conditions. This person should have the authority to stop the activities that are creating these conditions, and to eliminate the hazards.

12.2 Project Quality Control

12.2.1 Qualifications of project personnel

Personnel whether staff or contracted, should be qualified in accordance with Section 17 of ASTM E 2052. Qualification procedures are intended to ensure that personnel are competent to maintain the quality of program functions. They are also intended to ensure compliance with environmental, safety and health regulations, and lead hazard control regulations. Chapter 4 provides an overview of the process of qualifying personnel and organizations.

All personnel who work on the lead hazard control project should be qualified on the basis of training and, as appropriate, certification or relevant experience. Qualifications, including initial training, refresher training, and certification must meet applicable regulatory requirements. Consultants and contractors should be responsible for ensuring that their personnel are trained and certified, as required by Federal, State, and local regulations. Possession of these qualifications should be documented.

12.2.2 Review of contractor submittals

Prior to any lead hazard control project a review of contractor submittals must be conducted. Contractor submittals should include, proper licenses, current worker training certificates, current worker physicals, worker respirator fit tests,

encapsulants, other products to be used, shop drawings (if necessary), material safety data sheets, and certificates of insurance.

Contractor submittals should be reviewed by the project designer prior to any lead hazard control work to ensure that the information is current and valid.

12.2.3 Quality control inspections

The contractor and the project manager should perform inspections of the work area and work practices on a daily basis. The project manager should notify the contractor of any deficiencies observed. The contractor should correct the deficiency and the project manager note the deficiency was corrected. As a last resort, the dispute resolution procedure in the contract documents may be invoked. The dispute resolution procedure is often independent arbitration by a third party. This is usually time consuming and can cause lengthy project delays. Records of the inspections, often in the form of a checklist, should be maintained on file.

12.2.4 Encapsulant testing with ASTM standard guide E 1796

ASTM standard guide E 1796 was written with the intention to provide building users such as commercial and private building owners, contractors, architects, homeowners and regulatory authorities with assistance in selecting an appropriate liquid coating encapsulation product for normal use situations for abating lead paint. The guide also provides information than can be used to assist in determining whether a painted surface is suitable for encapsulation, applying a liquid coating encapsulation product, evaluating installed liquid coating encapsulation products, and maintaining the encapsulated surface.

Prior to the application of an encapsulant on a particular surface, patch tests should be performed in accordance with Standard E 1796. This is done to ensure that the liquid coating encapsulation product will perform under the specific combinations of surface conditions and use found throughout the encapsulation project. The results of patch tests should be evaluated thoroughly before selecting an encapsulation product.

In addition, encapsulant application should be inspected in accordance with Standard E 1796. The application process should be monitored and a final inspection should be conducted to ensure proper installation of encapsulation products.

12.2.5 Project monitoring

Air, dust, and soil levels should be monitored in accordance with Section 11 of ASTM E 2052. Baseline air, dust, and soil samples should be obtained, as appropriate. Baseline air samples may be assumed to be below OSHA, state or local action levels in the absence of contrary information. Air and dust wipe samples should be collected and analyzed during the lead hazard control project (in accordance with Section 18 of ASTM E 2052), to ensure that the project is not creating additional hazards. Sampling should also be conducted following accidents and other events that may have resulted in releases, to determine the extent of contamination.

12.2.5.1 Air sampling

Air sampling is utilized to assess worker exposures during abatement activities. "Exposure monitoring" refers to the measurement of a worker's exposure to an airborne contaminant, regardless of the respiratory protection worn. Air samples are collected outside of any respirator worn (except during abrasive blasting work when it is worn beneath the hood) within the worker's breathing zone. Often collection devices are attached to the shirt collar. OSHA requires that exposure monitoring consist of full-shift samples (at a minimum, one sample for each job classification in each work area). When there are multiple shifts, all shifts or the shift with the highest expected exposure level should be monitored. Sampling should be representative of a worker's regular, daily, and highest exposure to lead since the degree of worker protection provided may depend on the results.

Sampling plans for abatement jobs should be developed by an industrial hygienist or other qualified occupational safety and health professional on a case-by-case basis.

NIOSH and OSHA have published sampling methods for airborne lead, with guidelines for acceptable precision and accuracy. The chosen sampling method used for monitoring should have an accuracy rate not less than ± 25 percent at the action level of 30 $\mu g/m^3$. Laboratories used should be accredited for environmental lead analysis.

If sampling reveals employee exposures to lead are at or above the action level, but not exceeding the OSHA permissible exposure limit (PEL) (50 $\mu g/m^3$), then employers must perform monitoring at least every six months. If employee exposures are above the PEL, then monitoring must be performed at least every 3 months. The monitoring must be continued every six months (or every 3 months) until at least two consecutive measurements, that are taken at least one week apart, are below the action level (or PEL). Written results of their

exposure must be provided within 5 (working) days of personal sampling.

Other air sampling that may be performed is "area" sampling. Area samples are collected near the work activity or at the perimeter of the lead hazard work area. This type of sampling can be used to assess the exposure of a potential bystander. This type of sampling does not meet OSHA monitoring requirements.

ASTM Standard E 1553, "Practice for Collection of Airborne Particulate Lead During Abatement and Construction Activities", may be helpful in conducting air monitoring during projects.

12.2.5.2 Dust sampling

Dust sampling may be performed during abatement projects to assess the extent with which abatement activities may or may have not contaminated nearby areas. Dust sampling should be utilized when a project occurs in a dwelling that residents will be returning to while the project is ongoing. For example, if residents will be returning in the evening to their dwelling where lead abatement activities have occurred, wipe samples for dust should be collected outside the existing containment to ensure that the containment is effective.

ASTM Standard E 1728, "Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques" may be used for guidance in collecting settled lead dust samples.

12.2.5.3 Soil sampling

As with the collection of dust samples, soil sampling may be used to assure that an ongoing project has not created an even greater lead hazard. It may also be used during a project requiring soil removal to determine if lead-contaminated soil has been adequately removed.

ASTM E 1727, "Practice for Field Collection of Soil Samples for Lead Determination by Atomic Spectrometry Techniques" may be used as guidance in the collection of project monitoring soil samples.

12.2.6 Project observations

Observations made during a lead hazard control project are vital to ensure that the project is being performed correctly and as specified in project documents. The process of observing will also assure that the proper safety precautions are taken to protect workers and occupants.

12.2.6.1 Using a checklist

A checklist is an excellent way to ensure that observations made at a project address areas of concern. The checklist will allow various inspectors to maintain consistency between inspections of lead hazard control projects.

12.2.6.2 Elements of the checklist

A checklist should be designed specifically for each lead hazard control project. The checklist will help to ensure that the lead hazard control work is completed, and done safely. A checklist might include, but may not be limited to, the following:

- Are workers wearing personal protection equipment (respirators, coveralls, gloves, and eye protection)?
- Is the project set up as described in the job specifications? Are they using a containment, ground coverings, plastic sheeting? Is it set up correctly?
- Is lead-based paint being removed as described in project specifications?
- Are the correct components being removed during this lead hazard control project?
- Are the proper areas being encapsulated or enclosed?
- Is waste generated from the lead hazard control project being disposed of properly?

These are just a few of the items a checklist might address. The questions a checklist will address are going to vary on a job-to-job basis.

12.3 Work Site Cleaning Activities

When feasible, the worksite should be cleaned before work commences in accordance with the project specifications and the HUD Guidelines, Chapter 14.

12.3.1 Baseline samples for air, dust and soil

If baseline samples are to be collected, collect, air, dust, and soil samples, as necessary to establish baseline data. If clearance samples are higher than expected, baselines can confirm whether or not lead levels were elevated prior to abatement activities commencing. Samples can be archived until clearance issues are resolved. Baseline sampling is not always performed.

12.3.2 Pre-cleaning of work site per HUD Guidelines

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves

the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the worksite preparation level selected. If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning, but before resident items are moved back in.

12.3.3 Clean-up during the work

Clean up during the work has two aspects, ongoing and daily cleaning procedures. Ongoing cleaning during the job involves HEPA vacuuming during the lead hazard control work, as necessary to minimize the tracking of dust and paint chips from one area to another (e.g., when paint chips or dust are being generated).

Daily cleaning procedures are more extensive and should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about one hour). Daily cleaning helps achieve clearance dust levels by reducing a build-up of lead dust. It also helps limit worker exposures. While daily cleaning can be skipped in vacant dwellings units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior, as needed.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

1. Large debris

   Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced (as defined in Chapter 10 of the HUD Guidelines).

2. Small Debris

   After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated waste storage area. Waste bags should not be overloaded; overloaded bags may rupture or puncture during handling or transport.

3. Exterior Cleaning

   Areas potentially affected by exterior lead hazard control should be protected via a containment system (explained in Chapter 8 of the HUD Guidelines). Because weather can adversely affect the efficacy of exterior containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be placed or vacuumed into single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

   General worker protection measures are discussed in Chapter 9 of the HUD Guidelines. Studies have indicated that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Workers should wear appropriate personal protective equipment and the appropriate level of respiratory protection for the lead dust concentration.

5. Maintaining Containment

   The integrity of the containment used in a lead hazard control project must be maintained. Workers should monitor the containment and immediately repair any holes or rips with 6-mil plastic and duct tape.

12.3.4 Clean-up at conclusion of work

Final cleaning procedures must be completed before treated surfaces can be painted or sealed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than one hour after active lead hazard control work has ceased.

As the first stage in the final cleaning, floor plastic should be misted and swept. Upper level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water and cleaned. All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor. Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA vacuum, wet wash, and HEPA vacuum (HEPA/wet wash/HEPA) cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, materials prior to their removal from lead hazard control containment areas should be implemented, as described below (and further in Chapters 9 and 10 of the HUD Guidelines).

Work clothing, work shoes, and tools should not be removed from work area unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a through HEPA vacuuming followed by washing.

Preliminary Visual Inspection

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected sources must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

Final Inspection

The final clearance evaluation should take place at least one hour after the final cleaning. Clearance inspections have three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. The clearance criteria may be specified by regulation (EPA 40 CFR 745) if applicable, or Chapter 15 of the HUD Guidelines.

Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests; the HEPA/wet wash/HEPA-

cleaning cycle should be carefully and methodically repeated. Failing the clearance criteria is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

12.3.5 Waste characterization

Waste that exhibits the Toxicity Characteristic (TC) poses a substantial threat to human health and the environment. Waste toxicity is measured by using the Toxicity Characteristic Leaching Procedure (TCLP) (40 CFR 261.24). The TCLP leachate is analyzed for lead (or other constituents) to determine if it is above or below the allowable TC regulatory threshold, which for lead is 5 ppm (milligrams/liter).

A representative TCLP sample consists of a collection of the various components of the waste in the same weight proportion as is found in the entire bulk of the waste. As such, a representative sample should contain a sample of all major items found in the entire waste stream, in an accurate weight proportion.

ASTM Standard Guide E 1908 for *Sample Selection of Debris Waste from a Building Renovation or Lead Abatement Project for Toxicity Characteristic Leaching Procedure (TCLP) Testing for Leachable Lead (Pb)* should be considered.

12.4 Clearance Procedures

Clearance procedures are intended to establish that lead hazard control work is completed and that levels of lead in dust, air, and bare soil, as applicable, are at or below the maximum allowable levels so that entry to the facility by unprotected workers, and for reoccupancy is allowed.

12.4.1 Establish clearance criteria

Prior to beginning a lead hazard control activity the clearance criteria should be established. The information that should be determined may include types of samples to take (dust, soil, or air, or all three), locations and numbers of samples required (unit addresses), single surface or composite samples, acceptable lead levels, and required turnaround time for sample results.

In some cases clearance may not always include sampling. For projects, which entail minimal or no disturbance of leaded paint surfaces, judgment should be used in deciding whether sampling is necessary, unless it is required by applicable regulations. Projects that may not require clearance sampling would be Level 1 projects as defined in the HUD Guidelines or NIBS Specifications, but at a minimum would require a clearance visual examination.

12.4.2 Visual inspection of the work site

A visual examination determines whether the work on all interior and exterior surfaces to be treated was in fact completed and to ensure that no visible settled lead dust or debris are present. Visual clearance is a relatively straightforward process requiring an understanding of the scope of the job and a keen eye for detail. It is essential that clearance examiners have full knowledge of the extent of the work and specifically which surfaces did *not* require treatment.

The visual examination of completed work should be done on a room-by-room basis to ensure that all areas are examined (this includes exterior and common areas). Visual examination is performed to verify that the actual lead hazard control project performed has been satisfactorily completed. This includes, but is not limited to, the verification of paint removal, building component removal and replacement, verification of adequate enclosures, completion of soil treatments, the presence and proper application of encapsulants, and successful implementation of the wide variety of interim control measures.

The second part of the visual examination is that for settled dust and debris. There should be no evidence of settled dust following a cleanup effort. If dust is observed, the contractor must be required to repeat the cleaning effort before clearance dust samples are collected to avoid conducting dust sampling twice. Any settled dust present following abatement or interim control work provides sufficient evidence that cleanup was not adequate.

Finally, the grounds around the dwelling should also be examined visually to make certain that all waste and debris have been removed and that leaded dust or paint chips were not transferred outside the dwelling. Examiners should be particularly careful about looking for paint chips when exterior components have been disturbed.

12.4.3 Clearance testing protocol for dust

A visual examination alone is not adequate for determining if a residence is safe for occupancy, since small dust particles are not visible to the naked eye. Since these smaller dust particles are associated with an increased risk of lead poisoning, clearance dust testing is required to determine if a leaded dust hazard remains following lead hazard control work.

Unless U.S. Environmental Protection Agency (EPA) regulations establish different clearance levels or if state or

local regulations are more stringent, the following HUD clearance standards should be used, based on wipe sampling:

- 100 $\mu g/ft^2$ for floors.
- 500 $\mu g/ft^2$ for interior window sills.
- 800 $\mu g/ft^2$ for window troughs and exterior concrete or other rough surfaces.

ASTM Standard E 1728, "Standard Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry", may be used as guidance in the collection of settled dust wipe samples. Dust samples must be analyzed by laboratory methods such as atomic absorption spectroscopy, inductively coupled plasma-emission spectroscopy, laboratory XRF using standard methods, or other equivalent analytical methods. Only laboratories that participate in a national proficiency-testing program and are accredited by EPA NLLAP should be used.

If the dust sample from any surface indicates a leaded dust level above the clearance standard, all similar surfaces in the dwelling represented by the sample represents (e.g., all interior window sills or floors) should be recleaned and retested. Only the similar components need to be recleaned, not necessarily the entire dwelling. If any such surface fails twice, the property owner should consider additional hazard control measures and/or further sealing of the surface.

Multifamily Housing

It is possible to conduct clearance dust sampling in a number of randomly selected dwelling units in multifamily housing where similar dwelling units have undergone comparable types of lead hazard control activity. The random sampling can be performed for a portion, or the entire housing development. In either case the randomly selected units represent a specified group of housing units. The contractor must not know in advance which units will be sampled since this would bias the results. In addition, it is necessary to choose an adequate number of randomly selected units, use Table 6.1 to determine this number. Significant cost savings could be realized with such a sampling plan. However, the implications of random sampling should be understood fully before it is used. First, if the random sampling shows that levels of leaded dust are too high, it will be necessary to reclean not only the affected component in the selected dwelling unit, but also the affected component in all the other units that the randomly selected unit was meant to represent. Alternatively, all the units represented by the randomly selected unit could be sampled individually to determine which ones need recleaning.

Second, insurance carriers covering lead hazard control work may demand a higher degree of assurance that the work was performed properly in each and every dwelling. The extra cost of dust sampling in all units is likely to be minor compared to the liability of a child with an elevated blood lead level in an abated unit that was not sampled, but was later found to contain high levels of leaded dust.

Third, there have been significant failure rates in obtaining compliance with clearance dust standards demonstrated (in both the ongoing public housing program and the HUD Demonstration Project). Failure rates as high as 19% have been observed. High rates of failure argue for more extensive unit-by-unit testing.

In spite of all the above caveats, there is one special situation that lends itself to random clearance sampling. A large vacant apartment building or housing development that will not be immediately reoccupied following abatement could conceivably be randomly sampled at the end of the project and, if necessary, completely recleaned. Alternatively, all units could be sampled to determine which ones require recleaning.

Single-Family Housing and Multifamily Housing (Fewer than 20 Units)

Clearance dust sampling should be conducted in every single-family dwelling unit and in all multifamily housing with less than 20 units. Because treatment and housing conditions vary so greatly in these housing units, random sampling is inappropriate.

Location and Number of Clearance Dust Samples

Clearance dust samples should be taken either from specific locations near the area where the lead hazard control treatment was done, from nearby high-traffic areas (around doorways, for example), or from other areas. The clearance examiner may determine which specific site is best based on the type of treatment, visual observation, and professional judgment. The abatement contractor must not know exactly where the clearance samples will be collected. The number of clearance samples depends on whether composite or single-surface clearance samples are collected.

Table 12.1 (Table 15.1 of the HUD Guidelines) categorizes the different types of treatment requiring clearance sampling and the number and location of single surface and composite wipe samples.

12.4.4 Clearance testing protocol for soil

If no exterior lead hazard control work was performed, it is not necessary to conduct any soil sampling. Clearance soil sampling should be conducted following any abatement or

interim control treatment on the exterior of a house or soil treatment. The purpose of such testing is to ensure that the treatment did not contaminate soil surrounding the dwelling.

Clearance soil sampling is typically conducted around the foundation of the house, although it is also important to collect samples in play areas that could have been contaminated as a result of the work. All soil samples should be composite samples. If the exterior work involved covering bare soil areas only, clearance soil samples are not needed; a visual examination is adequate. A detailed protocol for soil sampling is provided in Appendix 13 of the HUD Guidelines and ASTM Standard E 1727.

Multifamily housing

If a large complex of multifamily housing has undergone similar lead hazard control work, random sampling of the soil around the building can be conducted using the sampling scheme for lead-based paint inspection.

Single Family Housing

If exterior lead hazard control work was done, composite soil samples should be collected near the building foundation close to the work area and in nearby play areas that could have been contaminated by the work. All single-family housing units should be cleared by sampling.

Number and Location of Clearance Soil Samples at Each Building

One composite soil sample should be collected around the perimeter of the building. If only selected faces of the building were treated, the samples should come from the locations of those faces. A second composite soil sample should be collected from any nearby play areas.

In both cases bare soil should be sampled preferentially. If there is no bare soil, the soil covering should be sampled to determine if it has been contaminated by the lead hazard control work.

12.4.5 Clearance testing protocol for air

When conducting clearance air sampling the action level provided by OSHA should be used. Currently the OSHA action level for lead in air is 30 $\mu g/m^3$. In some cases states might have an existing or proposed level for lead in air that is below the OSHA action level. When there is another standard that exists always defer to that which is more stringent. It should also be noted that the user may specify lower levels as part of the project specifications.

12.4.6 Special procedures for small projects

For projects, which entail minimal or no disturbance of lead paint surfaces, use judgment to determine whether sampling is necessary, unless it is required by applicable regulations. At a minimum visual inspections should be performed for these projects.

12.4.7 Post-clearance risk assessments

In facilities which did not have a lead risk assessment prior to lead hazard control work, conduct a lead risk assessment for classification purposes in accordance with the lead hazard management program.

12.4.8 Clearance inspection/testing report

A written report should be provided detailing the results of any visual examinations and the types, quantities, and locations of clearance sampling performed and the analytical results.

12.5 Lead Hazard Control Project Documentation

12.5.1 Written clearance report

A written clearance report should be provided documenting the clearance procedure used and the results and the date for the first ongoing monitoring visit. The clearance report should state the accredited/certified individual performing the clearance and the accredited laboratory performing the analyses. It is also a good practice to include a copy of the appropriate licensing, accreditation, and certification for the inspector and laboratory.

The clearance testing report should include, but not be limited to: results that were used to determine that the lead hazard to be controlled by the project has been controlled; results of any testing done to determine that the work area and other areas affected by the project have been left in occupiable condition with respect to lead issues; documentation of the work's completion; a description of any other work performed as part of the project and its successful completion, particularly if such work could affect present or future lead hazard potentials.

12.5.2 Statement of Lead-Based Paint Compliance

Depending on the jurisdiction and the type of abatement or interim control work undertaken, the owner may be awarded a Statement of Lead-Based Paint Compliance. Obtain a Statement of Lead-Based Paint Compliance if required by regulations or by insurance or lenders. The statement does not guarantee that no lead hazards will develop after its issuance. This Statement should be kept for the duration of the life of the

building, since it is to the benefit of the owner to retain this information.

12.5.3 Project monitoring results

All project monitoring results should be included in the final report submitted to the owner. This documentation should be kept to demonstrate that during the project, levels of lead outside the lead hazard control project area did not escalate and the precautionary measures taken during the lead hazard control project were effective.

12.5.4 Waste manifests/statements

A hazardous waste manifest must accompany all hazardous waste shipments (unless the waste is generated by a conditionally exempt, small quantity generator). The manifest is a multicopy form that tracks the waste from generator to final disposal. The generator, transporter, and a representative of the designated management facility must each sign this document and retain a copy.

The generator's signature certifies that (1) the manifest is complete and accurately describes the shipment, (2) the shipment is ready for transport, and (3) reasonable efforts have been made to minimize the amount and toxicity of the waste generated.

The designated waste management facility must return a signed copy of the form to the generator to confirm that the waste reached its destination. Generators are required to retain all manifests for 3 years. However, for liability reasons, records should be kept for at least ten years, and preferably for the life of the facility.

12.5.5 Other documentation

The project file should contain sufficient documentation to recreate the events and decisions that occurred. The other documents retained often include the following:

- Project specifications and contract documents.
- Submittals of the contractor.
- Minutes of project meetings.
- Notifications and permits.
- Worker and visitor logs.
- Inspection checklists.

12.6 Post Project Activities

12.6.1 Reclassification of the facility

Perform reclassifications in accordance with Figure 3.1. Review the previous classification of a facility that has completed a lead hazard control project and reclassify that facility if appropriate.

If the facility is reclassified as a Class C facility unless new information is discovered that could change this classification. A Class C facility does not require any further action under ASTM E 2052. However, facility environmental, safety, and health programs in accordance with applicable laws, regulations, and the policies of the owner, property manager, and as applicable, lessor(s) should be implemented.

If the facility is reclassified as Class A or Class B, revise the lead hazard management plan and continue to implement the program. Facilities should be scheduled for ongoing monitoring and reevaluation and for further work when lead hazards are known or presumed to exist.

12.6.2 Ongoing monitoring and reevaluation

The written clearance report issued following a lead hazard control project should include recommendations for ongoing monitoring and reevaluation. Ongoing monitoring and reevaluation are discussed in Chapter 13.

Table 12.1: Recommended Minimum Number and Location of Single-Surface Dust Samples

Clearance Category	Category Description	Number and Location of Single-Surface Wipe Samples in Each Area[1]	Number and Location of Composite Wipe Samples
1	Interior Treatments No containment within dwelling.	Two dust samples from at least four rooms in dwelling (whether treated or untreated): ♦ One interior window sill or window trough, alternating between rooms. ♦ One floor. AND ♦ For common areas, one for every 2000 ft^2 of a common area room floor (if present).	Three composite samples for every batch of four rooms (whether treated or untreated): ♦ One floor composite. ♦ One interior window sill composite. ♦ One window trough composite. AND ♦ For common areas, one floor subsample for every 2,000 ft^2 (if present); up to 8,000 ft^2 can be sampled for each composite.
2	Interior Treatments With containment (plastic sheeting as airlock on doors between treated and untreated areas).	Same as Category 1 but only in every *treated* room (up to four rooms) AND One floor sample outside the containment area, but within 10 feet of the airlock to determine the effectiveness of the containment system. This extra single-surface sample is recommended in 20 percent of the treated dwellings in multifamily housing and *all* single-family homes. ♦ For common areas, one floor sample for every 2,000 ft^2 and one floor sample outside containment.	Same as Category 1, but only in every *treated* room AND One floor sample outside the containment area, but within ten feet of the airlock to determine the effectiveness of the containment system. This extra single-surface sample is recommended in 20 percent of the treated dwellings in multifamily housing and *all* single-family homes. ♦ For common areas, one floor subsample for every 2,000 ft^2 (up to 8,000 ft^2 for each composite) and one floor sample outside the containment.
3	Exterior Treatments	Two dust samples as follows: ♦ At least one dust sample on a horizontal surface in part of the outdoor living area (e.g., a porch floor or entryway). ♦ One window trough sample on each floor where exterior work was performed. An additional trough sample should be collected from a few lower floors to determine if troughs below the area were contaminated by the work above.	Two dust samples as follows: ♦ One composite on a horizontal surface in part of the outdoor living area (e.g., a porch floor or entryway). ♦ One window trough composite for every four floors where exterior work was not done, if present.

Clearance Category	Category Description	Number and Location of Single-Surface Wipe Samples in Each Area[1]	Number and Location of Composite Wipe Samples
4	Routine maintenance work	At least one floor dust sample for every 20 high-hazard jobs near the work area ("high hazard" jobs are defined in Chapter 17 of the HUD Guidelines)	Same as single-surface sampling.
5	Soil treatment	One dust sample from the entryway.	One dust sample form the entryway.

[1] A room includes a hallway or a stairway. If no window is present, collect just one floor sample. When a closet is treated, the room to which it is attached should be tested. A closet is not considered to be a separate room. If all rooms received similar treatments and cleaning, only four rooms need to be sampled for clearance purposes. More rooms may need to be sampled in larger dwellings. The room to be sampled should be selected based on where most of the dust-generating work was done or in the judgment of the clearance examiner.

CHAPTER 13: ONGOING MONITORING AND EVALUATION

[This chapter corresponds to ASTM E 2052, section 16]

13.1 Need for Ongoing Monitoring and Evaluation

Ongoing monitoring and reevaluation procedures are used in facilities in which potential sources of lead hazards have not been controlled. These procedures are intended to verify that previously instituted control measures remain effective and new lead hazards are detected in a timely manner. Figure 13.1 provides an overview of the ongoing monitoring and reevaluation process. Ongoing monitoring and reevaluation should be conducted in accordance with the HUD Guidelines, Chapter 6.

13.2 Frequency of Reevaluations

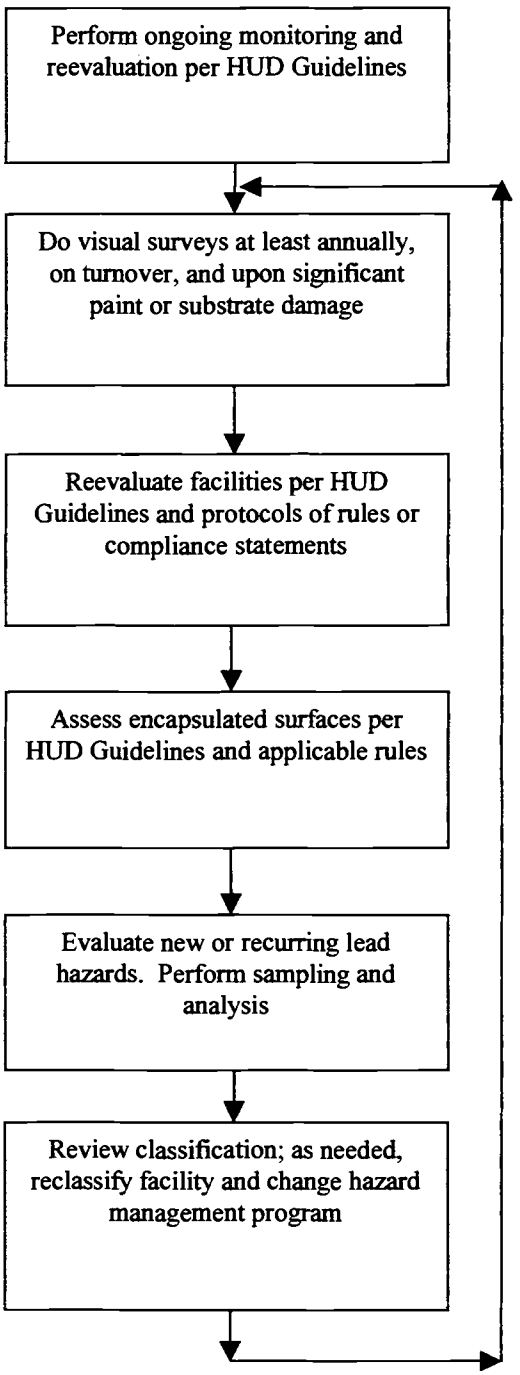
Reevaluations occur at specific intervals; these intervals are defined by standard reevaluation schedules. Standard reevaluation schedules are based upon the likelihood that a dwelling contains or will contain leaded paint hazards.

13.2.1 Using Standard Reevaluation Schedules

Standard reevaluation schedules are based on the following principles:

- Well-defined reevaluation intervals are needed to ensure consistency across dwellings and to provide clear criteria for risk assessors to determine when a unit should be reevaluated.
- Dwellings that pass a risk assessment or reevaluation require less frequent reevaluations than dwellings that fail.
- The presence of leaded dust in excess of applicable standards shortens the reevaluation interval since it indicates an immediately available source of exposure for occupants, especially children.
- The expected duration of hazard control actions affects the reevaluation interval; less frequent reevaluation is needed when more permanent abatement methods are implemented over interim controls that have a shorter life span. For example, a longer reevaluation interval is specified when windows with lead-based paint are

Figure 13.1: Ongoing Monitoring and Reevaluation



- replaced since windows are thought to be significant sources of leaded dust.

- If all lead hazards are controlled through encapsulation or enclosure (and leaded dust levels prior to hazard control were below the standard), then only annual visual surveys are recommended because failure of these methods can usually be visually determined.

- Repeated reevaluation failure will result in the assignment of the shortest possible reevaluation interval and may be an indication that the selected hazard control measures are inadequate for the unit in question.

- Full removal of all lead-based paint requires no reevaluation or monitoring, since new hazards are very unlikely.

Table 6.1 of the HUD Guidelines is a useful reference to determine the reevaluation schedule for each facility or building.

13.3 Conducting the Reevaluation

Reevaluations are used to determine if the following conditions have reappeared:

- Leaded dust above applicable standards.
- Deteriorated paint films with known or suspected lead-based paint.
- Deteriorated or failed interim controls, or encapsulant or enclosure treatments.
- New bare soil with lead levels above applicable standards.

These conditions can be detected through a visual examination, as well as through the use of limited dust and soil sampling.

13.3.1 Visual inspection by the certified risk assessor

Prior to beginning a visual survey the certified risk assessor should begin by reviewing any past risk assessment, paint inspection, clearance, and reevaluation reports. If any other information regarding lead hazard control actions in use is available, it should also be reviewed. A careful visual examination of all control measures and any known or suspected lead-based paint should then be conducted to determine if the paint is still intact and the controls are well maintained. If any lead hazard control measure is failing (e.g., an encapsulant is peeling away from the wall, a painted surface is no longer stabilized, or an enclosure has been breached), the risk assessor conducting the reevaluation should identify acceptable options for controlling the hazard.

If a paint inspection was conducted previously, the risk assessor should use this information to discover whether any of the surfaces known to contain lead-based paint are now in deteriorated condition. If no inspection has occurred, then the assessor should assume that all painted surface contain lead-based paint and should consider any deteriorated paint to be a newly identified lead hazard. Alternatively, the deteriorated paint can be measured by x-ray fluorescence (XRF) or paint-chip laboratory analysis.

13.3.2 Dust Sampling

When all lead hazard controls have been visually examined and appear to be in place, the risk assessor can begin dust sampling. If lead hazard controls are not in place, they should be repaired before any dust sampling occurs. Dust measurements are intended not only to determine the effectiveness of the control measures in use, but also to determine if leaded dust has reaccumulated from other sources.

For reevaluations composite dust sampling is sometimes used as a cost-effective measure. At least two composite samples should be taken; one from floors and the other from either interior window sills or window troughs. The rules on composite dust sampling can be found in Chapter 5 of the HUD Guidelines. Samples should be collected as outlined in Chapter 5 of the HUD Guidelines, or from any other area based on the professional judgment of the risk assessor, that may contain elevated leaded dust levels.

NOTE TO REVIEWERS: Comments are requested on the use of composite samples for dust samples.

13.3.3 Soil Sampling

Soil sampling is not usually conducted for reevaluation, since the visual examination will discover if previously covered areas are now bare or if the interim controls used to cover soil are not working. If bare spots are identified, the risk assessor should recommend that the owner cover the bare spots and conduct more frequent (e.g., monthly) visual surveys to ensure that the soil stays covered. If the visual surveys indicate that the soil is not staying covered, more permanent soil treatments should be recommended (i.e., paving or removal)

13.3.4 Assessing previously encapsulated surfaces

Visual monitoring should be performed one month and six months after application of the encapsulant, then at the schedule specified in Chapter 6 of the HUD Guidelines, Table 6.1.

If during reevaluation examinations signs of wear and tear are apparent, the monitoring should be increased to a quarterly

basis for the next six months, then annually thereafter. Residents should be instructed to notify management if there is a need for repairs, on a timely basis, to prevent the development of a leaded paint hazard due to encapsulant deterioration.

It is important to note that in some cities and states, regulatory reexaminations may be required, including sampling of settled dust for lead analysis. As always the most stringent reevaluation procedure should be followed.

With each reassessment of an encapsulated surface a visual monitoring form should be filled out and kept on record by the owner. This document should include the name of the person performing the periodic visual monitoring, the date of the visual monitoring, the condition of the coating and signs of wear or deterioration, and results of any leaded dust tests performed. If encapsulant failure is observed or the encapsulant has been repaired, the reasons for failure (if known), corrective actions recommended or taken to repair failures, and any other information pertinent to the maintenance of the encapsulant should be included.

13.3.5 Other reevaluation criteria

The risk assessor must evaluate previously controlled hazards, but also identify new hazards. If deteriorated paint is discovered and no previous information exists about the lead content of that paint (or the information is inconclusive), the risk assessor should recommend that the spot be either tested or stabilized. If the paint contains lead above the applicable standard, the risk assessor should provide the owner with a range of interim control and abatement options.

13.4 Interpretation and Reporting of Results

The risk assessor conducting the report should produce a report documenting the presence or absence of leaded paint hazards. The assessor's report should identify any lead hazards previously detected and controlled and the efficacy of these interventions. Any new hazards should also be described and the risk assessor should present the owner with suggested control options and their accompanying reevaluation schedules. In all cases the report should identify when the next reevaluation should occur, if further monitoring is necessary.

Based on the revaluation results the facility may be reclassified, as appropriate. Facilities that are reclassified from Class A or B to Class C do not require future evaluations.

CHAPTER 14: REAL ESTATE TRANSACTION PROCEDURES

[This chapter corresponds to ASTM E 2052, section 12]

14.1 Developing a Standard Operating Procedure for Real Estate Transactions

Standard operating procedures for real estate transactions should be included in the Lead Hazard Management Plan to ensure compliance with regulations and protect future occupants by requiring the full disclosure of known lead hazards and potential lead hazards.

As summarized in Figure 14.1, the written standard operating procedure should include methods for:

- Disclosing the presence of known lead-based paint and lead hazards when offering facilities for sale or lease
- Ensuring that contracts for the purchase or lease of facilities comply with regulatory requirements
- Evaluating vacant land for soil lead hazards prior to purchase or lease

It is also recommended that prior to purchasing or leasing facilities, the prospective owner/lessee classify the facilities as Class A, B, or C and perform lead hazard evaluations as appropriate.

An example outline for a Real Estate Transaction SOP is provided in Exhibit 14.1. Information for developing procedures for disclosure and contract language is provided below. Soil sampling methods are covered in Chapter 17 and classifying and evaluating facilities is addressed in Chapters 5 and 6, respectively.

Exhibit 14.1 Example Outline
Standard Operating Procedure for
Real Estate Transactions

I. Purpose and Applicability of Real Estate Transaction Procedures
II. Procedures for Selling Facilities
  A. Disclosure of known lead based paint and/or lead-based paint hazards
    1. What must be provided to potential purchasers
    2. When disclosure will be made
  B. Required contract language
III. Procedures for Leasing Facilities
  A. Disclosure of known lead based paint and/or lead-based paint hazards
    1. What must be provided to potential lessees
    2. When disclosure will be made
  B. Required contract language
IV. Procedures for Purchasing or Leasing facilities
  A. Review of documentation
  B. Evaluation of vacant land for soil lead hazards
  C. Classification of facilities as Class A, B or C and determination if further evaluation is necessary
V. Documentation and Record Maintenance

14.2 Regulatory Requirements for Real Estate Transactions

An estimated 1.7 million children in the U.S. have elevated blood lead levels. Often, the source of lead exposure is in their homes. As one of several initiatives to reduce lead exposure in homes, Section 1018 of the Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title X) mandated EPA and HUD to promulgate the disclosure regulations described below.

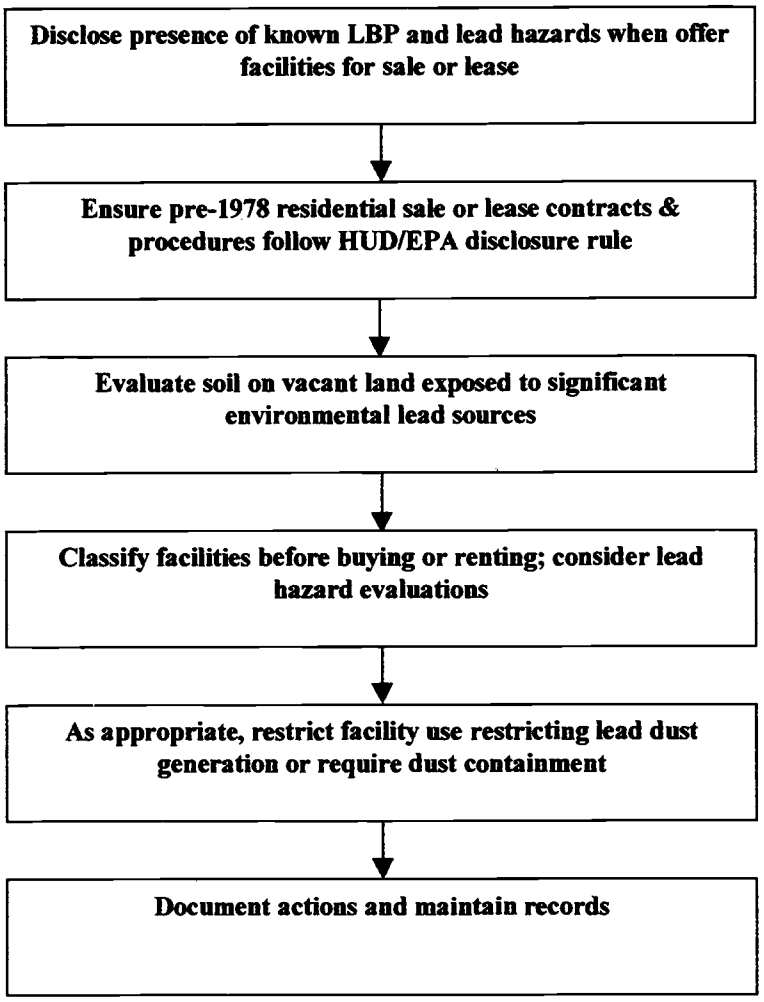
Requirements for Disclosure of Known Lead-Based Paint and/or Lead Based Paint Hazards in Housing (HUD 24 CFR Part 34 and EPA 40 CFR Part 745) – EPA and HUD jointly promulgated these regulations that require the disclosure of known lead-based paint hazards by persons selling or leasing target housing. Target housing is any housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any child who is less than 6 years of age resides or is expected to reside in such housing) or any 0-bedroom dwelling.
The permitted exclusions for disclosure requirements are:

- Transactions to sell properties at foreclosure

Rental housing found to be free of lead-based paint (as determined by a certified inspector)

- Short term leases of 100 days or less
- Lease renewals (if the lessor has previously disclosed all the required information)
- The purchase, sale, or servicing of mortgages
- The sale or lease of 0-bedroom dwellings (i.e. efficiency apartments, dormitories)

Figure 14.1: Real Estate Transactions



- Informal rental agreements

The regulations contain explicit requirements for lessors, sellers, and sellers' agents. The categories of activities include disclosure requirements for sellers and lessors, providing purchasers the opportunity to conduct an evaluation, certification and acknowledgment of disclosure, and agent responsibilities.

Disclosure Requirements

Sellers and lessors are required to conduct the following activities before the purchaser or lessee is obligated under contract to purchase or lease unexempt target housing:

Provide the purchaser or lessee with an EPA-approved lead hazard information pamphlet such as the EPA document entitled *Protect Your Family From Lead in Your Home* (EPA #747-K-94-001), or an equivalent pamphlet that has been approved for use in the State by EPA.

1. Disclose to the purchaser or lessee and the agent the presence of any known lead-based paint and/or lead hazards in the subject property and any additional information available concerning the known lead-based paint and/or lead-based paint hazards. Examples of this information include the basis for the determination that lead-based paint and/or lead-based paint hazards exist; the location of lead-base paint and/or lead-based paint hazards; and the condition of the painted surfaces.

2. Inform the agent of the existence of any available records or reports pertaining to lead-based paint and lead-based paint hazards.

3. Provide to the purchaser or lessee any available records or reports pertaining to lead-based paint and/or lead-based paint hazards in the subject property. This requirement includes records and reports regarding common areas and other residential dwellings in multifamily target housing (if the information is part of an evaluation or lead hazard control effort in the target housing as a whole).

Opportunity to Conduct an Evaluation

A seller must provide a ten day period for the purchaser to conduct a risk assessment or inspection for lead-based paint before the purchaser is obligated under contract to buy the target housing.

Certification and Acknowledgment of Disclosure (Required Contract Language)

Exhibit 14.2 provides a sample format for the information that must be included in contracts for selling target housing. The required elements are:

1. A lead warning statement (See Exhibit 14.2).

2. A statement disclosing the presence of known lead-based paint and/or lead-based paint hazards in the subject housing; or a statement indicating no knowledge of the presence of lead-based paint and/or lead-based paint hazards.

3. A list of any available records or reports pertaining to lead-based paint and/or lead-based paint hazards that has been provided to the purchaser. If no such information is available the seller should so indicate.

4. A statement of the purchaser affirming receipt of the above information.

5. A statement by the purchaser that he/she has either received the opportunity to conduct a risk assessment or inspection or has waived the opportunity.

6. If an agent is involved in the transaction on behalf of the seller, a statement that the agent has informed the seller of the regulatory requirements for disclosure and the agent is aware of his/her duty to ensure compliance with these requirements.

7. The dated signatures of the sellers, agents, and purchasers, certifying the accuracy of their statements, to the best of their knowledge.

Certain information must also be included in contracts for leasing target housing. This information is similar to the information discussed above, with a few modifications. An example format is provided in Exhibit 14.3 and the elements are described below.

1. A lead warning statement (See Exhibit 14.3).

A statement disclosing the presence of known lead-based paint and/or lead-based paint hazards in the subject housing; or a statement indicating no knowledge of the presence of lead-based paint and/or lead-based paint hazards.

Exhibit 14.2: Sample Disclosure Format for Target Housing Sales

Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards

Lead Warning Statement

Every purchaser of any interest in residential real property on which a residential dwelling was built prior to 1978 is notified that such a property may present exposure to lead from lead-based paint that may place young children at risk of developing lead poisoning. Lead poisoning in young children may produce permanent neurological damage, including learning disabilities, reduced intelligence quotient, behavioral problems, and impaired memory. Lead poisoning also poses a particular risk to pregnant women. The seller of any interest in residential real property is required to provide the buyer with any information on lead-based paint hazards from risk assessments or inspections in the seller's possession and notify the buyer of any known lead-based paint hazards. A risk assessment or inspection for possible lead-based paint hazards is recommended prior to purchase.

Seller's Disclosure

(a) Presence of lead-based paint and/or lead-based paint hazards (check (i) or (ii) below):

(i)—Known lead-based paint and/or lead-based paint hazards are present in the housing (explain).

_____

(ii)—Seller has no knowledge of lead-based paint and/or lead-based paint hazards in the housing.

(b) Records and reports available to the seller (check (i) or (ii) below):

(i)—Seller has provided the purchaser with all available records and reports pertaining to lead-based paint and/or lead-based paint hazards in the housing (list documents below).

_____

(ii)—Seller has no reports or records pertaining to lead-based paint and/or lead-based paint hazards in the housing.

Purchaser's Acknowledgment (initial)

(c) —Purchaser has received copies of all information listed above.

(d) —Purchaser has received the pamphlet *Protect Your family from Lead in Your Home.*

(e) —Purchaser has (check (i) or (ii) below):

(i)—received a 10-day opportunity (or mutually agreed upon period) to conduct a risk assessment or inspection for the presence of lead-based paint and/or lead based paint hazards; or

(ii)—waived the opportunity to conduct a risk assessment or inspection for the presence of lead-based paint and/or lead-based paint hazards.

Agent's Acknowledgment (initial)

(f) —Agent has informed the seller of the seller's obligation under 42 U.S.C. 4852d and is aware of his/her responsibility to ensure compliance.

Certification of Accuracy

The following parties have reviewed the information above and certify, to the best of their knowledge, that the information they have provided is true and accurate.

_____	_____	_____	_____
Seller	Date	Seller	Date
_____	_____	_____	_____
Purchaser	Date	Purchaser	Date
_____	_____	_____	_____
Agent	Date	Agent	Date

(Adapted from 24 CFR Part 35, Vol. 61, No. 45, Wednesday, March 6, 1996)

Exhibit 14.3: Sample Disclosure Format for Target Housing Rentals and Leases

Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards

Lead Warning Statement

Housing built before 1978 may contain lead-based paint. Lead form paint, paint chips, and dust can pose health hazards if not managed properly. Lead exposure is especially harmful to young children and pregnant women. Before renting pre-1978 housing, lessors must disclose the presence of known lead-based paint and/or lead-based paint hazards in the dwelling. Lessees must also receive a federally approved pamphlet on lead poisoning prevention.

Lessor's Disclosure

(a) Presence of lead-based paint and/or lead-based paint hazards (Check (i) or (ii) below):

(i)—Known lead-based paint or lead-based paint hazards are present in the housing (explain).

_____

(ii)—Lessor has no knowledge of lead-based paint and/or lead-based paint hazards in the housing.

(b) Records and reports available to the lessor (Check (i) or (ii) below):

(i)—Lessor has provided the lessee with all available records and reports pertaining to lead-based paint and/or lead-based paint hazards in the housing (list documents below).

_____

(ii)—Lessor has no reports or records pertaining to lead-based paint and/or lead-based paint hazards in the housing.

Lessee's Acknowledgment (initial)

(c) —Lessee has received copies of all information listed above.

(d) —Lessee has received the pamphlet *Protect Your Family from Lead in Your Home.*

Agent's Acknowledgment (initial)

(e) —Agent has informed the lessor of the lessor's obligations under 42 U.S.C. 4852d and is aware of his/her responsibility to ensure compliance.

Certification of Accuracy

The following parties have reviewed the information above and certify, to the best of their knowledge, that the information they have provided is true and accurate.

_____	_____	_____	_____
Lessor	Date	Lessor	Date
_____	_____	_____	_____
Lessee	Date	Lessee	Date
_____	_____	_____	_____
Agent	Date	Agent	Date

(Adapted from 24 CFR Part 35, Vol. 61, No. 45, Wednesday, March 6, 1996)

2. A list of any available records or reports pertaining to lead-based paint and/or lead-based paint hazards that has been provided to the purchaser. If no such information is available the seller should so indicate.

3. A statement of the lessee affirming receipt of the above information.

4. The dated signatures of the lessors, agents, and lessees, certifying the accuracy of their statements, to the best of their knowledge.

14.3 Good practices regarding lead hazards and property transfers or leases

The purpose of the disclosure requirements is to inform the prospective purchaser or lessee about lead-based paint and/or lead-based paint hazards at a particular dwelling. The regulations allow the disclosure to be made at any time as long as it is done before the purchaser or lessee becomes obligated under any contract to purchase or lease the housing. Therefore the final rule identifies only the latest point at which full disclosure must occur.

Considering the fact that whenever disclosure is made, the prospective buyer has 10 days to conduct an evaluation if he/she chooses, there is no advantage in delaying disclosure. If the required disclosure activities are conducted after the purchaser or lessee has made an offer to purchase or lease the housing, the seller or lessor cannot accept the offer until the purchaser or lessee has had an opportunity to review the information and possibly amend the offer.

Good practice dictates that full disclosure in accordance with regulatory requirements should be made as early as practical, or basically when a perspective buyer or lessee indicates a strong interest in the property. Disclosure at this juncture would provide for a smoother negotiation and contracting process and ultimately save time.

14.4 Records and Documentation Review

If feasible, all documents that are reviewed should be originals. Photocopies should only be accepted if they are signed and authenticated. The origin of the document is also important. If the document is dated before the training certification requirements under EPA regulation 40 CFR Part 745 Lead: Requirements for Lead-Based Paint Activities in Target Housing and Child Occupied Facilities were published (August 29, 1996), it may be desirable to perform the risk assessment or the inspection again using the protocols established by these regulations.

Prior to the promulgation of this regulation risk assessors and inspectors were certified by State certification programs and were only required to use State approved methods. In the States that did not have certification programs it was permissible for risk assessors and inspectors certified in other States to perform the work. Untrained individuals may also have performed the work. For these reasons, it is important to always ascertain the credentials of the risk assessors and inspectors.

14.4.1 When buying a property

When buying a property the purchaser must make informed decisions and evaluations of the available information. It is therefore necessary for the purchaser to understand the material being presented. Depending on the type and extent of data available for review, the purchaser may find it beneficial to retain a qualified and certified lead consultant to assist in reviewing the documents. For example, if a pre-1978 property inspection report indicates that the property is "lead free", a person knowledgeable about lead evaluations might question the data. Even if the lead-based paint has been removed, it is very unlikely that the property is lead free. The lead-based paint, when it was used on bare wood, would sink into the outer part of the wood. This lead-based paint remains in the wood, as a measurable amount of lead. This lead can still be measured, even after the lead-based paint has been removed.

The prospective purchaser should review any records of previous abatement actions, in particular, the criteria used to determine that all the work was performed. Certain questions should be answered by reviewing the data. Was abatement work conducted in all or only part of the building? A previous risk assessment of the building may have only required certain areas to be abated to deal with hazards existing at the time. If it is unclear as to the extent of the work, then another evaluation should be scheduled.

Was the work was inspected upon completion? If it was, who did the inspection? (Much of the early abatement work was performed without third party inspection for clearance.) Was the inspector certified as an inspector or as an accredited lead consultant? What clearance criteria were used? If any dust wipe samples were collected during the clearance inspection their results should also be reviewed.

If a prospective purchaser retains a consultant to conduct an evaluation, all the information available should be presented to the inspector. This will help prevent the inspector from recording false negative readings that may be obtained with an XRF instrument during any subsequent inspection. (*An X-ray Fluorescence analyzer is used to measure the amount of lead in a surfacing material.)* With this knowledge the inspector

will conduct the inspection in a manner that does not only require the use of an XRF.

The lead-based paint inspection will reveal only if lead-based paint is present or absent. E 2052 recommends that a risk assessment be performed to determine if actual lead hazards exist. The lead-based paint inspection also does not reveal the presence of leaded paint. Leaded paint can also be a source of lead hazards. Lastly, the lead-based paint inspection does not look at other possible lead sources besides paint.

The following documents should be reviewed before buying target housing:

- Copy of the Federal pamphlet "Protect Your Family from Lead in Your Home" or a State developed pamphlet approved by EPA
- Disclosure statement including the lead warning statement

If available:

- Previous inspections reports
- Previous risk assessment reports
- Reports of any interim control measures, abatement, or soil remediation actions
- Abatement clearance reports
- Any other sampling data
- Certifications of inspectors, risk assessors, consultants and contractors

The information pamphlet and the lead warning statement must be presented in the language of the contract. For example if the contract is in Spanish then these items must also be in Spanish.

If there is not enough information available regarding the potential lead hazards or the presence of lead based paint to make an informed decision, the prospective purchaser will need to decide if further investigation is warranted. Classification of the facility as Class A, B, or C (see Chapter 5) and performance of a risk assessment and/or inspection for lead hazards is recommended. If the subject property is vacant land, soil sampling for lead contamination may be warranted (depending on its location).

14.4.2 When selling a property

Just like the purchaser, the seller must understand and be knowledgeable about lead-based paint and lead-based paint hazards in their home. It is important that the information is assembled in a manner that is presentable to either or their agent and or the potential buyer. The information should be packaged in the sequence of the events, and in a way that a potential purchaser can review and examine. The seller must try to present a true picture of the lead-based paint and or lead-based paint hazards at their property. It is also in their interest to prove that the work was done in a proficient manner and professionals performed the work. To do this it may be necessary to seek other documentation from contractors and consultants who were engaged to perform the work.

The informational package to be provided to the prospective buyer must include the following documents:

- Copy of the Federal pamphlet "Protect Your Family from Lead in Your Home" or a State developed pamphlet approved by EPA
- Disclosure statement including lead warning statement

If available:

- Previous inspections reports
- Previous Risk Assessment reports
- Reports of any abatement or soil remediation actions
- Abatement clearance reports
- Any other sampling data
- Certification of inspectors, risk assessors, consultants and contractors

14.4.3 When leasing a property (lessor)

Regulations require disclosure notice including a lead warning statement to be part of the lease agreement. The lessee must also receive an EPA pamphlet or State pamphlet approved by the EPA. The lessor is responsible to present any available lead risk assessment or inspection reports to the lessee. The lessor does not have to provide any information for leases of 100 days or less providing no lease renewal or extension can occur. If however both parties wish to extend a previously exempted short-term lease beyond the 100-day limit, all previsions of the rule must be satisfied.

14.4.4 When leasing a property (tenant)

Lessees should use the information provided to them (described above) to decide if their families have the potential to be exposed to lead-based paint and/or lead based paint hazards. For multi-family housing, if there is no information available on the specific unit of interest, the prospective lessee should inquire about available data for other units and/or common areas of the facility. If there is doubt, or for any reason the information is suspicious, a person knowledgeable about lead evaluations should be consulted.

For those who are considering the lease of an entire facility, the recommendations described for purchasers would apply.

CHAPTER 15: ELEVATED BLOOD LEAD LEVEL INVESTIGATIONS

[This chapter corresponds to ASTM E 2052, section 13]

Blood lead levels as low as 10 µg/dl are associated with harmful effects on children's learning and behavior. Very high blood lead levels, exceeding 70 µg/dl, can cause serious health consequences, including seizures, coma and death. The percentage of children with elevated blood lead levels has dropped significantly over the years as leaded gasoline and lead solder used for canning food has been phased out. However, in 1997, the CDC estimated there are still 890,000 U.S. children with blood lead levels above 10 µg/dl. Lead-based paint remains the prevalent source of lead exposure for U.S. children.

15.1 Introduction to elevated blood lead level (EBL) findings

Periodically the CDC issues guidance for screening children for lead. In 1991 the CDC guidance called for virtually universal screening of children 12-72 months of age. In November 1997 the CDC issued revised guidance calling for targeted screening of children in high risk areas or groups. The CDC guidance recommends that each state should develop a plan for childhood lead screening. This targeted screening approach recommends that child health-care providers screen children using a blood lead test at ages 1 and 2; and children 36-72 months of age not previously screened, if they meet one of the following criteria:

1. The child resides in a zip code that according to the U.S. Census Bureau has ≥27% of the housing built before 1950.

2. The child receives services from public assistance programs for the poor, such as Medicaid or the Supplemental Food Program for Women, Infants, and Children (WIC).

3. The child's parent or guardian answers "yes" or "don't know" to any of the following three questions:

- Does your child live in or regularly visit a house that was built before 1950? This can apply to a facility such as a home day-care center or the home of a babysitter or relative.

- Does your child live in or regularly visit a house built before 1978 with recent or ongoing renovations or remodeling (within the last 6 months)?

- Does you child have a sibling or playmate who has or did have lead poisoning?

Where a state does not develop a statewide plan for screening children, or provide other formal guidance, local health officials and child health-care providers are advised by CDC to continue screening all children for lead.

15.1.1 Blood lead level screening

Blood lead level measurements are the most widely accepted and commonly used measure of lead exposure. The actual blood sample is collected at the direction of the child's physician or by a public health official associated with a local (county or city) or state health department. The samples are sent to a laboratory accredited to analyze for lead in blood and the results expressed as micrograms lead per deciliter whole blood.

A blood lead level of less than 10 µg/dl is not considered elevated. Values between 10-14 µg/dl are of concern and warrant further screening (e.g., repeat testing). If two consecutive blood lead levels for a child are equal to or exceed 15 µg/dl, or any one measurement is equal to or exceeds 20 µg/dl, an environmental investigation should be performed to determine the source of lead exposure. Lead concentrations at these levels are termed "environmental investigation blood lead levels."

15.1.2 Notifications of elevated blood lead level

Most notifications of an elevated blood lead level to a property owner or facility manager will come from a local or state public health official. A notification may also come directly from a child's health care provider.

The CDC has established classes of children based on their blood lead level. Figure 15.1 lists the classes, blood lead level, and suggested follow-up activities recommended by CDC.

The facility owner or manager must cooperate with the local health department or other appropriate agency when notified about an elevated blood lead child at their facility. The actual investigation of the possible sources of lead exposure will normally be performed by a representative of the local health

Figure 15.1 Interpretation of blood lead test results and follow-up activities: Class of Child based on blood lead concentrations

Class	Blood lead concentration (µg/dl)	Comment
I	= or <10	A child in Class I is not considered to be lead-poisoned
IIA	10 – 14	Many children (or a large proportion of children) with blood lead levels in this range should trigger community-wide childhood lead poisoning prevention activities. Children in this range may need to be screened more frequently.
IIB	15 – 19	A child in Class IIB should receive nutritional and educational interventions and more frequent screening. If the blood lead levels persist in this range, environmental investigation and intervention should be done.
III	20 – 44	A child in Class III should receive environmental evaluation and remediation and a medical evaluation. Such a child may need pharmacologic treatment of lead poisoning.
IV	45 – 69	A child in Class IV will need both medical and environmental interventions, including chelation therapy.
V	= or >70	A child in Class V lead poisoning is a **medical emergency.** Medical and environmental management must begin **immediately.**

(Adapted from CDC, Preventing Lead Poisoning in Young Children. A statement by the Centers for Disease Control, October 1991. U.S. Department of health and Human Services/Public Health Service)

agency. In some jurisdictions this may be performed by a private qualified consultant working for the health agency.

The purpose of the investigation is to identify the cause, or causes of the child's lead poisoning. The objective is to reduce or eliminate further exposure so the child can get well. The purpose of the EBL investigation is not to find fault and fix blame. The owner should recognize that in addition to cooperation and sharing of information, decisions regarding relocation of the family (if necessary) and the appropriate control measures necessary should be a joint decision including the child's parents and local regulatory agency.

15.2 Elevated blood lead level investigations

The notice to a facility owner or manager will not necessarily occur prior to the start of the investigation. The local health agency may conduct the questionnaire of the child's parents and perhaps perform some investigative work in the child's residence, day-care center, or possibly investigate neighborhood sources. More typically, the investigation will begin concurrent with notice to the facility owner or manager. The local health agency is not obligated, and in many instances prohibited to release any detailed "medical information" concerning the child.

In some states the primary care physician and/or the laboratory are required to report elevated blood lead level results to the local health agency so the abatement of the lead source(s), education of the family, and other appropriate remediation steps may be performed.

Outlined in the following paragraphs are the elements of a typical elevated blood lead level investigation. The extent of involvement by the property owner or manager will largely be at the discretion of the public health agency conducting it. In most instances the agency representatives will look to the owner or manager to provide assistance, records, test data, and other information.

15.2.1 Conduct the investigation

The investigation often begins with a visit to the child's dwelling and administration of a detailed questionnaire to elicit information about possible lead exposures and sources. Based on the child's medical evaluation, the questionnaire findings and other available information various possible lead sources may be indicated. These include:

- Environmental sources – lead-based paint, lead-contaminated soil or dust, plumbing leachate, ceramicware, and leaded gasoline.
- Hobbies and Related Activities – glazed pottery making, target shooting at firing ranges, lead soldering, painting, pouring fishing sinkers, stained glass making, car/boat repair, and home remodeling.
- Substance Use – folk remedies that include lead, "health" foods, cosmetics, moonshine whiskey, and gasoline "huffing" (sniffing).
- Occupational – lead contamination carried home on the clothing or person from occupations that use lead.

15.2.2 Comprehensive interview using the HUD questionnaire

A copy of the HUD guidelines questionnaire is included at the conclusion of this chapter as Figure 15.3. The HUD questionnaire is based on the CDC guidance for investigating lead sources responsible for elevated blood lead levels in children. The purpose of including the questionnaire here is not to encourage facility owners to conduct their own "investigations," but to gain an understanding of the information the local health agency investigator will be requesting. While many of the questions are designed to elicit information from the child's parents (i.e., child's diet, and parents' occupations) and to record the investigator's observations, some of the questions will be addressed to the facility owner or manager.

15.2.3 Review of risk assessments and other documentation

The investigator should ask to see the results of any lead-based paint inspections, paint characterizations, risk screens, or risk assessments performed in the child's dwelling unit. The investigator may also request such information for similar units, common areas, and exterior characterization of the facility or soil.

The investigator will likely ask to see maintenance, remodeling and renovation records for any work conducted in the past 12 months. This would likely include records of any lead abatement or control projects. The investigator should also inquire about the results of any lead in water sampling performed, name and contact for the local water authority, and any information available concerning the plumbing and drinking water fixtures in the child's dwelling.

The facility owner, manager or designated representative should cooperate fully with the investigator's requests. These requests may also include assistance in conducting targeted environmental testing.

15.2.4 Targeted environmental testing

Based on the investigator's initial findings, and the results of the questionnaire, the investigation may include targeted environmental testing. This testing will most likely include areas within the child's dwelling unit, common areas, and outside. The actual sampling will vary for each investigation, but may include any or all of the following:

- X-ray fluorescence (XRF) or laboratory paint-chip analysis of all defective paint on the dwelling, furniture, play structures, or on nearby buildings frequented by the child.
- XRF or laboratory paint-chip analysis of all chewable, impact, and friction surfaces.
- Dust samples from areas frequented by the child, including play areas, porches, kitchens, bedrooms, and living and dining rooms. Dust samples may also be collected from automobiles, work shoes, and laundry rooms to assess the leaded dust on work clothes brought into the dwelling if occupational lead exposure is a possibility.
- Soil samples from play areas near the foundation of the building and areas from the yard. If the child spend significant time at a park or other pubic play area, samples may also be collected from these areas.
- First-drawn and flushed water samples from the tap most commonly used for drinking water, infant formula, or food preparation.
- Glazed dinnerware or ceramic cookware possibly containing lead.

15.2.5 Report of findings

The overall results of the investigation are generally only released to the child's parents and public health authorities. Information concerning the building, lead hazards, and options for correction of those hazards are reported to both the building owner and the child's parents.

In some cases the source of the lead exposure will not be identified. In these instances the public health case manager will recommend a course of action that may include increased surveillance and other protective measures.

15.3 Owner's response to an EBL investigation

The public health agency and the facility owner will need to coordinate their efforts to control lead hazards identified by the investigation. Depending on the lead source, other agencies such as the local water authority, may also be involved. The control measures may include relocation of the affected occupants (child and family), temporary control measures, and permanent lead hazard control interventions.

For public housing, other federally supported housing programs, and certain publicly funded housing programs, regulations may require that all testing be completed within 5 days after an EBL child is identified. Most housing programs require the lead hazards be mitigated within 14 days if the child is not relocated. State or local regulations may establish different requirements and timelines. Figure 15.2 summarizes

the actions to be taken in response to notification of an EBL child.

15.3.1 Relocation of affected persons

Some lead sources can be corrected immediately, such as removal of lead-containing ceramicware. Some lead sources can be controlled, such as using bottled drinking water, until the source is corrected. Other lead sources may take time to control, such as deteriorated paint inside the child's dwelling unit. In these instances, relocation of the child, and often the family, is necessary. In some instances the investigation of one EBL child will find other children in the same building also at risk.

Where relocation is necessary, the family should be placed in a comparable unit that is known to be lead safe. Ideally, the relocation dwelling should be in the same building or neighborhood. The owner may be required to facilitate the relocation, or the local government may assume some or all of the responsibility. Depending on the nature of the lead source, the relocation may be temporary or permanent. In any event, provisions for school attendance, transportation, mail, and other factors may need to be performed expeditiously. Additional information on occupant relocation is provided in chapter 9.

15.3.2 Temporary control measures

The local health agency may recommend temporary control measures in response to an EBL child investigation. Usually such temporary measures are instituted while a permanent lead hazard control intervention is being implemented. For example, if the lead source is soil in the neighborhood playground it may be necessary to fence off the playground or make it inaccessible to children until a permanent solution is provided. Other temporary control measures may include specialized cleaning to remove lead dust from a child's dwelling unit, or the use of bottled water for drinking.

15.3.3 Permanent lead hazard control interventions

Permanent lead hazard control interventions should be performed, as appropriate, based on the EBL investigation findings and recommendations. These activities should be performed by personnel or firms trained, certified, and in most states licensed to perform lead hazard abatement projects. In a dwelling with an EBL child, the family and child is not permitted to enter the dwelling during the work, even at the end of the workday, unlike some lead hazard control projects.

15.3.4 Clearance testing and re-occupancy

Once all the lead hazard control measures are completed, clearance testing will be performed. Depending on the local jurisdiction, the clearance testing may be performed by (or on behalf of) the local health agency. Alternatively, clearance testing may be performed by an independent assessor hired by the facility owner and acceptable to the local health agency.

The specific clearance criteria will depend on the lead hazard abated. In most instances dust sampling or soil sampling will be performed, and the results will have to be below the applicable regulatory standards or guidelines. Other standards are applicable for water (15 ppb), plumbing fixtures and ceramicware.

The public health agency will normally permit re-occupancy of the child and family after acceptable clearance levels are achieved. Again, relocation is usually facilitated by the owner. Follow-up blood level testing will be performed by the child's health care provider to monitor the child's blood lead level.

Figure 15.2 Actions in Response to Notification of an EBL Child

1. **Cooperate with local public health (or housing department authorities** investigating the child's case by:

- Responding promptly to requests from local officials for information necessary to complete an environmental investigation;
- Providing local public health officials access to the unit and property for purposes of performing any environmental investigation; and
- Implementing lead hazard control measures directed by the agency.

2. **Obtain a risk assessment** by an independent certified risk assessor for the unit in which the EBL child resides, except in either of the following cases:

- The local health department (or other local agency) has already conducted an environmental investigation and the property owner has responded to any health department directives to control hazards in the unit; or
- The property is already covered by valid documentation of compliance by an independent, certified individual. In this case, all responsibility for hazard evaluation rests with the local government. (Note: Failure to promptly respond to notification of more than a *de minimis* amount of deteriorating paint invalidates such documentation of compliance.)

3. **Control all LBP hazards** identified by the risk assessor (or local agency official) within 15 days, and conduct post intervention dust tests. Where there is evidence of chewing, the control action should provide permanent protection, (for example, permanent covering or replacement of a window sill). If no LBP hazards are identified, the source of exposure is presumed to be other than the housing unit and no further action is required by the property owner.

4. **Notify affected tenants of risk assessment results and any hazard control actions taken.**

5. **Do not retaliate against tenants in response to the identification of an EBL child.**

6. **Relocate tenant if LBP hazards are not promptly controlled.** If any identified LBP hazard is not promptly controlled, the property owner shall pay to relocate the tenant to a unit of comparable quality, size, location, and rent that does not contain LBP hazards. In such cases, the vacated unit shall not be rented to a new tenant until the LBP hazards have been controlled and the unit has passed independent dust tests – unless the unit is located in a property where a Lead Hazard Control Plan is being implemented.

Figure 15.3: Resident Questionnaire for Investigation of Children with Elevated Blood Levels

General Information

1. Where do you think the child is exposed to the lead hazard?_____

2. Do you rent or own your home? rent own (circle)

   If rented, are there any rent subsidies? yes no (circle)

   If yes, what type: (check)

   ____Public housing authority

   ____Section 8

   ____Federal rent subsidy

   ____Other (specify):_____

   Landlord Information (or rent collector agent)

   Name:_____

   Address:_____

   Phone:_____

3. When did you/your family move into this home?

   Complete the following for all addresses where the child has lived in the past 12 months:

Dates of Residency	**Address (include city and State)**	**Approximate age of dwelling**	General condition of dwelling: **Any remodeling or renovation? Any deteriorated paint?**

4. Is the child cared for away from home? (This would include preschool, day-care center, day-care home, or care provided by a relative or friend.)
   If YES, complete the following:

Type of care	**Location of care (name of contact, address, and phone number)**	**Approximate number of hours per week at this location**	**General condition of structure. Any deteriorated paint? Any recent remodeling or renovation?**

Lead-Based Paint and Lead-Contaminated Dust Hazards

1. Has this dwelling been tested for lead-based paint or lead-contaminated dust?

   yes no (circle)

   If yes, when? Where can this information be obtained?_____

2. Approximately what year was this dwelling built?_____ If unknown, was the dwelling built before 1950?_____

3. Has there been any recent repainting remodeling, renovation, window replacement, sanding or scraping of painted surfaces inside or outside this dwelling unit? If yes, describe activities and duration of work in more detail._____

_____

_____

4. Has any lead abatement work been conducted at this dwelling recently?

   yes no (circle)

5. Where does the child like to play or frequent? (Include rooms, closets porches, outbuildings.)

6. Where does the child like to hide? (Include rooms, closets porches, outbuildings.)

Complete the following table:

Areas where child likes to play or hide	**Paint condition (intact, fair, poor, or not present)***	**Location of painted components with visible bite marks**

* Paint condition: Note location and extent of any visible paint chips and/or dust in window wells, on window sills, or on the floor directly beneath windows. Do you see peeling, chipping, chalking, flaking, or deteriorated paint? If yes, note locations and extent of deterioration.

Assessment: (check)

_____Probable lead-based paint hazard.

_____Probable leaded-dust hazard.

Action: (check)

_____Obtain records of previous environmental testing noted above..

_____XRF Inspection of dwelling (circle one): limited complete.

_____Paint testing-deteriorated paint: add any additional areas to HUD Guidelines Form 5.3.

_____Leaded dust sampling of home: add any additional areas to the list of rooms to be sampled, using HUD Guidelines Form 5.4.

_____Other sampling (specify):_____

Water Lead Hazards

1. What is the source of drinking water for the family? (circle) municipal water

   private well Other (specify):_____

   (This information will be used to help determine responsibility and methods of controlling lead exposures from water.)

   If tap water is used for drinking, please answer the following:

2. From which faucets do you obtain drinking water? (Sample from the main drinking water faucet)

3. Do you use the water immediately or do you let the water run for awhile first? (If water lead levels elevated in the first flush, but low in the flushed sample, recommend flushing the water after each period the water has remained standing in the pipe for more than 6 hours.)

   _____

4. Is tap water used to prepare infant formula, powdered milk, or juices for the children?

   If yes, do you use hot or cold tap water?

   If no, from what source do you obtain water for the children?

5. Has new plumbing been installed within the last 5 years? yes no (circle)

   If yes, identify location(s).

   Did you do any of the work yourself? yes no (circle)

   If yes, specify._____

6. Has the water ever been tested for lead? yes no (circle)

   If yes, where can the results be obtained?

Determine whether the dwelling is located in a jurisdiction known to have lead in drinking water in either public municipal or well water. Consult with State/local public health authorities for details. (check)_____at risk_____not at risk

Assessment: (check)

_____At risk for water lead hazards.

Actions: (check)

_____Test water (first-draw and flush samples)

_____Other testing (specify):_____

_____Counsel family (specify):_____

Lead in Soil Hazards

(Use the following information to determine where soil samples should be collected.)

1. Where outside does the child like to play?
2. Where outside does the child like to hide?
3. Is this dwelling located near a lead-producing industry (such as a battery plant, smelter, radiator repair shop, or electronics/soldering industry?) yes no (circle)
4. Is the dwelling located within two blocks of a major roadway, freeway, elevated highway, or other transportation structures?
5. Are nearby buildings or structures being renovated, repainted, or demolished?
6. Is there deteriorated paint on outside fences, garages, play structures, railings, building siding, windows, trims, or mailboxes?
7. Were gasoline or other solvents ever used to clean parts or disposed of at the property?
8. Are there visible paint chips near the perimeter of the house, fences, garages, play structures? If yes, not location.
9. Has soil ever been tested for lead? If yes, where can this information be obtained?

10. Have you burned painted wood in a woodstove or fireplace? If yes, have you emptied ashes onto soil? If yes, where?

Assessment: (check)

_____Probable soil lead hazard.

Actions: (check)

_____Test soil. Complete Field Sampling Form for Soil (HUD Guidelines Form 5.5). Obtain single samples for each bare soil area where the child plays.

_____Advise family to obtain washable doormats for entrance to the dwelling

_____Counsel family to keep child away from bare soil areas thought to be at risk.

(specify):_____

_____

Occupational/Hobby Lead Hazards

Use the information in this section to determine if the child's source of lead exposure could be related to the parents', older siblings' or other adults' work environment. Occupations that may cause lead exposure include the following:

- Paint removal (including sandblasting, scraping, abrasive blasting, sanding, or using a heat gun or torch).
- Chemical strippers.
- Remodeling, repairing, or renovating dwellings or buildings, or tearing down buildings or metal structures (demolition).
- Plumbing.
- Repairing radiators.
- Melting metal for reuse (smelting).
- Welding, burning, cutting, or torch work.
- Pouring molten metal (foundries).
- Auto body repair work.
- Working at a firing range.
- Making batteries.
- Making paint or pigments.
- Painting.
- Salvaging metal or batteries.
- Making or splicing cable or wire.
- Creating explosives or ammunition.
- Making or repairing jewelry.
- Making pottery.
- Building, repairing, or painting ships.
- Working in a chemical plant, a glass factory, an oil refinery, or any other work involving lead.

1. Where do adult family members work? (include mother, father, older siblings, other adult household members)

Name	Place of Employment	Occupation or Job Title	Probable lead exposure (yes/no)

2. Are work clothes separated from other laundry?
3. Has anyone in the household removed paint or varnish while in the dwelling? (includes paint removal from wood work, furniture, cars, bicycles, boats)

4. Has anyone in the house soldered electric parts while at home?
5. Does anyone in the household apply glaze to ceramic or pottery objects?
6. Does anyone in the household work with stained glass?
7. Does anyone in the household use artist's paints to paint pictures or jewelry?
8. Does anyone in the household reload bullets, target shoot, or hunt?
9. Does anyone in the household melt lead to make bullets or fishing sinkers?
10. Does anyone in the household work in autobody repair at home or in the yard?
11. Is there evidence of take-home work exposures or hobby exposures in the dwelling?

Assessment: (check)

_____Probable occupational-related lead exposure.

_____Probable hobby-related lead exposure.

Actions: (check)

_____Counsel family (specify):

_____Refer to (specify):

Child Behavior Risk Factors

1. Does child suck his/her fingers? yes no (circle)
2. Does child put painted objects into the mouth? yes no (circle)

   If yes, specify:_____
3. Does child chew on painted surfaces, such as old painted cribs, window sills, furniture edges, railings, door molding, or broom handles?

   If yes, specify:_____
4. Does child chew on putty around windows?
5. Does child put soft metal objects in the mouth? These might include lead and pewter toys and toy soldiers, jewelry, gunshot, bullets, beads, fishing sinkers, or any items containing solder (electronics)?
6. Does child chew or eat paint chips or pick at painted surfaces? Is the paint intact in the child's play areas?
7. Does the child put foreign, printed material (newspapers, magazines) in the mouth?
8. Does the child put matches in the mouth? (some matches contain lead acetate.)
9. Does the child play with cosmetics, hair preparations, or talcum powder or put them into the mouth? Are any of these foreign made?
10. Does the child have a favorite cup? A favorite eating utensil? If yes, are they handmade or ceramic?
11. Does the child have a dog, cat, or other pet that could track in contaminated soil or dust from the outside? Where does the pet sleep?
12. Where does the child obtain drinking water?
13. If child is present, note extent of hand-to-mouth behavior observed.

Assessment: (check)

_____Child is at risk due to hand-to-mouth behavior.

_____Child is at risk for mouthing probable lead-containing substance (specify):_____

_____Child is at risk for other (specify):_____

Actions: (check)

_____Counsel family to limit access or use of (specify):

_____Other (specify):_____

Other Household Risk Factors

1. Are imported cosmetics such as Kohl, Surma, or Ceruse used in the home?
2. Does the family ever use any home remedies or herbal treatments? (What type?)
3. Are any liquids stored in metal, pewter, or crystal containers?
4. What containers are used to prepare, serve, and store the child's food? Are any of them metal, soldered, or glazed? Does the family cook with a ceramic bean pot?
5. Does the family use imported canned items regularly?
6. Does the child play in, live in, or have access to any areas where the following materials are kept: shellacs, lacquers, driers, coloring pigments, epoxy resins, pipe sealants, putty, dyes, industrial crayons or markers, gasoline, paints, pesticides, fungicides, gasoline, gear oil, detergents, old batteries, battery casings, fishing sinkers, lead pellets, solder, or drapery weights?
7. Does the child take baths in an old bathtub with deteriorated or nonexistent glazing?

Assessment: (check)

_____Increased risk of lead exposure due to_____

Actions: (check)

_____Counsel family to limit access or use (specify):_____

_____Other (specify):_____

Assessment for Likely Success of Hazard Control Measures

1. What cleaning equipment does the family have in the dwelling? (circle)

   Broom, mop and bucket, vacuum (does it work?), sponges and rags
2. How often does the family:

   Sweep the floors?

   Wet mop the floors?

   Vacuum the floors?

   Wash the window sills?

   Wash the window troughs?
3. Are floor coverings smooth and cleanable?
4. What types of floor coverings are found in the dwelling? (circle *all* that apply)

   Vinyl/linoleum carpeting wood other (specify):_____

5. Cleanliness of dwelling (circle one):

   Code: 1=appears clean, 2=some evidence of housecleaning, 3=no evidence of housecleaning,

   4=_____, 5=_____, 6=_____, 7=_____

[Pick the best category based on overall observations of cleanliness in the dwelling.]

1. Appears clean.
2. Some evidence of housecleaning.
3. No evidence of housecleaning

No visible dust on most surfaces.
Evidence of recent vacuuming of carpet.
No matted or soiled carpeting.
No debris or food particles scattered about.
Few visible cobwebs.
Clean kitchen floor.
Clean doorjambs.
Slight dust buildup in corners.
Slight dust buildup on furniture.
Slightly matted and/or soiled carpeting.
Some debris or food particles scattered about.
Some visible cobwebs.
Slightly soiled kitchen floor.
Slightly soiled doorjambs.
Heavy dust buildup in corners.
Heavy dust buildup on furniture.
Matted and/or soiled carpeting.
Debris or food particles scattered about.
Visible cobwebs.
Heavily soiled kitchen floor.
Heavily soiled doorjambs.

Assessment: (check)

_____Cleaning equipment inadequate.

_____Cleaning routine inadequate.

_____Floor coverings inadequate to maintain clean environment.

Actions: (check)

_____Counsel family to limit access or use (specify):_____

_____Provide cleaning equipment.

_____Instruct family on special cleaning methods.

_____Flooring treatments needed.

_____Other (specify):_____

CHAPTER 16: RECORDS MANAGEMENT

[This chapter corresponds to ASTM E 2052, section 19]

16.1 Purpose of Record Keeping

The purpose of retaining records is to document the actions taken and the information considered at the time actions was taken. Records may also be retained to satisfy regulatory requirements.

16.1.1 Record of decisions made and information decisions based upon

Documentation procedures are intended to provide a permanent record of how decisions were made and what information they were based upon. Furthermore, documentation procedures serve to confirm that decisions made were carried out as planned. There are regulatory obligations that exist in terms of documentation, but perhaps more importantly there is the need to justify the actions that have been taken by a building owner or manager.

The program manager should develop a recordkeeping system that accommodates all necessary documentation, provides procedures for identification, collection, indexing, access, filing, storage, maintenance, disposal of records, and a method to ensure that documentation is complete for each lead hazard management activity.

16.1.2 Regulatory records retention requirements

Records should maintained as required by 40 CFR 745, 29 CFR 1926.62, 24 CFR 35, and other regulations. If state or local requirements are more stringent they should be followed. The OSHA lead standard requires that some records be maintained for as long as 30 years. Careful attention should be paid to the regulatory requirements, and when necessary seek out a legal counsel for assistance.

16.1.3 Legal assistance

A building owner or program manager should seek legal advice, as appropriate, to ensure the content and organization of records are adequate for legal purposes. A lawyer can help ensure documentation procedures are acceptable and defensible as well as vital information regarding what documents need to be retained and for how long they need to be maintained.

16.1.4 Records retention and disposal practices

Records should be retained at a central location within a facility where they are accessible to the lead hazard program manager and any other persons who might need access, including tenants. For many records, the hard copies of all information may be retained, or they may be stored on a computer, or other media. Original documents with original signatures are required to be retained for some regulatory purposes. Examples of such documents include accreditation certificates, signed laboratory reports, and signed lead risk assessment reports.

For larger facility managers or owners, such as a public housing authority, there may be a need for a main repository at a central office, but adequate records should still be maintained at the facility site for access.

Records may be disposed of when permitted by the applicable

Figure 16.1: Records are an important element of the Lead Hazard Management Plan

regulations, or at such time they will no longer be relied upon. Although records may no longer be needed they represent a snapshot of the decision logic used at that period of time and whether the decisions were consistent with the standard of care at that time. Alternatives to record disposal might be to maintain obsolete records on microfilm or electronically.

16.2 Records maintenance

16.2.1 Tenant notifications, including oral communications

Property owners and managers should maintain documentation of all tenant notifications made with regard to lead hazard management activities. Keep copies of letters or notices that may have been delivered to tenants, in addition have complete information as to which tenants received such notifications. When a notification is communicated orally to a tenant, that too should be documented. For example, if a notification is part of a presentation given to tenants of a building, documentation should be kept as to what was discussed at the meeting and what information was provided. Attendance at such meetings or seminars should be recorded. A sign-in sheet may be distributed to those who attend for recordkeeping purposes.

16.2.2 Maintenance records

Keep accurate records of maintenance activities that have occurred at the facilities covered under the lead hazard management program. These records may be useful when an unexpected lead hazard is discovered. By consulting these records the owner or manager can determine if maintenance activities assisted in the development of this new hazard or if they did not play a role in its creation. Work orders may be retained to detail the maintenance activities that have occurred. In addition, maintenance records can demonstrate that the correct procedures were used when conducting these activities.

16.2.3 Lead hazard management plan

The lead hazard management plan details the nature and severity of lead hazards and potential lead hazards that are known to exist throughout the facility. In addition, the lead hazard management program supports a written plan that includes standard operating procedures to deal with lead hazards that exist within a facility.

The lead hazard management plan should be retained as a reference source for property owners and managers as well as tenants. Furthermore, the plan can be a useful tool for an occupant education and protection program.

16.2.4 Prioritizing decisions for lead hazard control projects

Thorough documentation should be maintained on how lead hazard control projects are prioritized. The situation may arise when a tenant becomes angry at the perceived lack of attention a lead hazard is receiving. The property owner or manager may demonstrate through their documentation the rationale used to make decisions for lead hazard control projects and assure there was no preferential treatment in the decision making.

An example of a situation that could arise is a tenant sees a building similar to his or her own having the windows with lead-based paint on them removed, but sees no effort made to have the windows removed from their building. They are justifiably concerned about the health and well being of their 5-year old child and question why no effort has been made to remove the windows on their own building. By maintaining comprehensive records detailing the prioritization reasons it can be demonstrated that the current lead hazard control project is being performed in a building with 8 children under the age of six living in it, including 4 infants. The angry tenant's building has 2 children under the age of six. For this reason the current building with 8 children under six is of a higher priority.

16.2.5 Lead hazard evaluation projects

Property owners and program managers should retain all records from lead hazard evaluation projects for the duration of the time they own a building. At the point that a facility owner wishes to sell a building he or she is required by Title X to disclose all known lead-based paint hazards and provide copies of available reports. The information provided can help purchasers and occupants take exposure prevention precautions during later ownership or occupancy. Other records concerning leaded paint and lead hazards unrelated to paint should also be disclosed at this time.

The lead hazard evaluation reports will also be needed for occupant education, revisions to maintenance and custodial practices, and planning lead hazard control projects. As control projects are performed the lead hazard evaluation records will need to be amended to reflect the new status of the facility.

16.2.6 Lead hazard control projects

Lead hazard control projects should have documentation regarding the extent of the work performed and its effectiveness. This information will provide a record of what control projects have been performed at a facility, their locations, and to what extent they were successful. The

chronological order of the records will also present the sequence in which projects were organized, and show which projects received greatest priority.

16.2.7 Qualifications of personnel and contractors/consultants

The owner or property manager should maintain information about the qualifications of personnel, contractors, consultants, and laboratories. Below is a list of the minimum records to be retained for this purpose.

- Copies of licenses and certifications
- Training records of in-house personnel
- Evidence of laboratory accreditation(s)
- Medical surveillance records of in-house personnel (as appropriate)
- Respirator fit-test records (as appropriate)
- Records of any disciplinary measures taken

16.2.8 Occupational safety and health records

The measures taken to protect workers who may be exposed to lead hazards should be documented to ensure that the proper procedures were taken to secure the health and safety of personnel. Records of air monitoring and medical surveillance should be maintained in accordance with OSHA. Information about training provided to workers and the types of engineering and work practice controls implemented should be documented. Also, efforts to protect the health and well being of staff who may come in contact with lead hazards should be recorded.

16.2.9 Clearance reports

The results of lead control project clearance inspections should be maintained and available to the occupants. The clearance criteria used for each project should also be retained.

16.2.10 Waste management records

Waste management records should detail the methods used in disposing of lead materials. TCLP results for generated waste from lead hazard control projects should be maintained to ensure that generated waste received the proper designation as hazardous or non-hazardous. Copies of waste manifests should be retained to demonstrate the disposal of hazardous lead waste in a proper landfill. Generators of hazardous waste are required to maintain hazardous waste manifests and results of hazardous waste testing for 3 years. However, for liability reasons records should be kept for at least 10 years.

16.2.11 Ongoing monitoring and reassessment reports

This information serves the same purpose as maintaining records of lead hazard evaluation projects in that all known lead hazards should be disclosed during a sale. By keeping this information current the owner can provide the most accurate information during a sale of property. In addition, the complete record of dates of the ongoing monitoring and reassessments displays that the owner or property manager has adhered to the Standard Reevaluation Schedules set forth in the HUD Guidelines. The results of reclassification of facilities (i.e., Class B→Class C) following a lead hazard control project should also be retained.

16.2.12 Sampling and analytical records

All sampling and analytical data should be maintained. Any air sampling data collected during maintenance procedures may serve as a negative exposure assessment for personnel conducting the same activity in or near the area of a potential lead hazard. Records pertaining to quality assurance procedures followed should also be kept.

16.2.13 Elevated blood lead investigations and corrective action records

Records documenting the complete history of an elevated blood lead level investigation should be maintained permanently. The records should include a copy of any written notice of an elevated blood lead individual. If the notice was verbal, a record of the conversation should be included. These records should document when the notice was received, when the investigation began, and when it was completed. The records should also include copies of any questionnaires administered, site investigations (including environmental sampling), and the results of the investigation. A record documenting what control measures or other interventions were taken should be kept, along with records of any follow-up inspections performed.

16.2.14 Real estate transaction records

Real estate transaction records relating to the disclosure of information related to lead-based paint, or other lead-related documents should be retained. If selling a property covered by the applicable regulations the information disclosed should be clearly documented. Who the information was disclosed to and when the information was disclosed should also be clear. The potential purchaser has the right to review all reports and data in the seller's possession concerning lead-based paint and lead-based paint hazards. This includes the results of past lead-based paint hazard control projects. As a purchaser, copies should be made of the historical documents related to the lead status of the property and retained for future use.

CHAPTER 17: SAMPLING AND ANALYSIS PROCEDURES

[This chapter corresponds to ASTM E 2052, section 18]

17.1 Sampling and Analysis Planning

Many of the standard operating procedures in the Lead Hazard Management Plan include sampling and analytical requirements for lead in air, soil, dust, paint and wastes. This chapter addresses the steps that are necessary to ensure that appropriate, reliable sampling and analytical data are obtained to support the decision making process. As outlined in Figure 17.1, the critical tasks include establishing data collection objectives; developing a sampling and analytical plan that implements procedures for quality control and documentation; conducting the sampling and analysis; and compiling the report.

17.1.1 Data collection objectives

The first task in developing a sampling and analytical plan is to establish the data collection objectives. The stated objectives should address the following questions:

- Why is the data needed?
- What questions should the data answer?
- What decisions will be made based on the data?
- What level of statistical confidence is required?
- What data is required for inclusion in reports for regulatory or contract compliance?

Table 17.1 summarizes some of the typical lead hazard control activities, the types of samples typically collected, and their purpose.

17.1.1.1 Questions to be answered

The types of questions to be answered can be illustrated by conducting an interior lead abatement project involving wet scraping of lead-based paint from windows, door frames and molding.

It is likely that personal air samples and dust wipe samples would be collected. Personal air samples to determine worker exposures are required by OSHA. The question to be answered by the personal exposure data is the "What is the airborne concentration of lead in the worker's breathing zone over an entire shift?" The data will be used to determine if

Figure 17.1: Sampling and Analysis

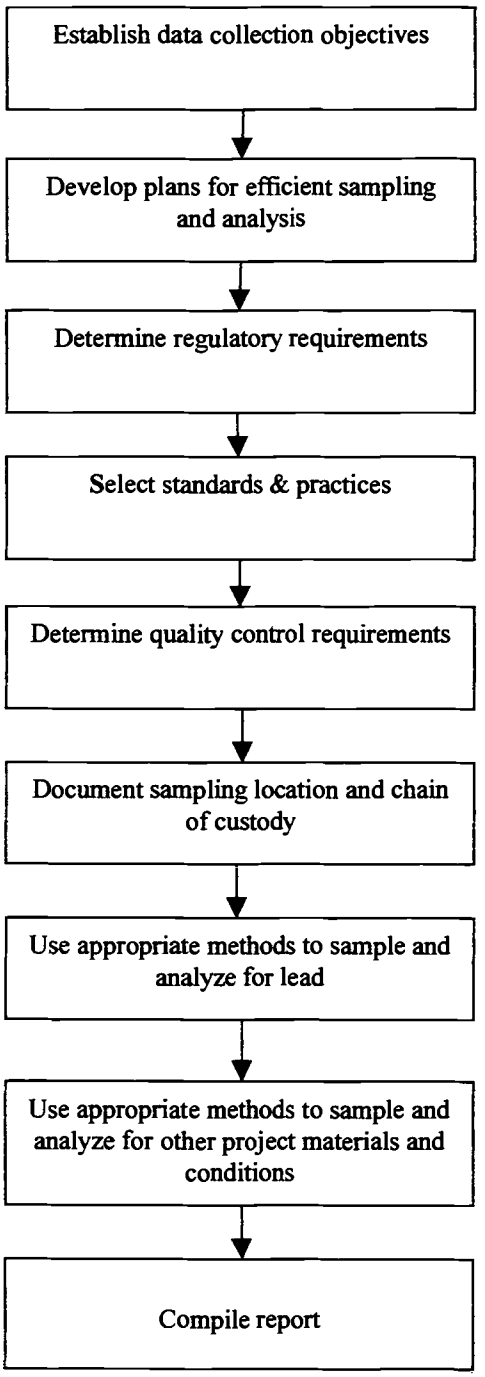


Table 17.1 Summary of Types of Samples for Lead Hazard Control Activities

ACTIVITY	PURPOSE	TYPE OF SAMPLE(S)	ASTM SAMPLING AND ANALYTICAL METHOD(S)/PROCEDURES
As part of a Risk Assessment	To assess the potential for a lead exposure hazard	Dust wipe	Dust wipe sampling (ASTM E 1728, E 1792, and E 1644)
		Dust vacuum	Dust vacuum sampling (ASTM E 1973 and E 1644)
		Soil	Soil sampling for lead (ASTM E 1727 and E 1726)
		Sometimes water	Water sampling for lead (ASTM D 3559, E 1726, and D 5463)
Paint Inspections	To identify locations of lead-based paint	X-Ray Fluorescence	In situ lead analysis by XRF (ASTM E 1755)
		Paint chips[1]	Paint chip sampling and analysis (ASTM E 1729, E 1645, and E 1613)
		Chemical spot tests	Chemical spot test kit measurements (ASTM E 1753 and E 1828)
Prior to a lead hazard control activities	To determine baseline concentrations	Dust wipe	Dust wipe sampling (ASTM E 1728, E 1792, and E 1644)
		Soil	Soil sampling for lead (ASTM E 1727 and E 1726)
During lead hazard control activities	To determine the effectiveness of containment	Dust wipe	Dust wipe sampling (ASTM E 1728, E 1792, and E 1644)
	To measure worker exposures	Air	Air sampling for lead (ASTM E 1553 and E 1741)
After completion of lead hazard control activities	To determine if the area is suitable for re-occupancy	Dust wipe	Dust wipe sampling (ASTM E 1728, E 1792, and E 1644)
Prior to disposal of waste generated during lead hazard control activities	To determine if the material is a characteristic hazardous waste	Bulk	Waste analyses for EPA 40 CFR 261 determination (ASTM E 1908 and Appendix II – Method 1311, 40 CFR Part 261)

[1] May also be used to determine leaded paint

the worker's exposures are over or under the OSHA permissible exposure limit (50 $\mu g/m^3$ as an 8-hour TWA) and if the level of respiratory protection provided to the worker is appropriate.

Dust wipe samples might be collected outside the containment area to determine if lead dust is effectively contained by engineering controls and work practices. The question to be answered by perimeter dust wipe samples would be "Are the concentrations of lead dust on surfaces outside, but near the containment area, the same during abatement as they were before abatement began?" The data will be used to either document that containment was effective or to indicate that procedures need to be modified to minimize the spread of contamination outside the containment area.

Dust wipe samples may also be collected inside the abatement area once work is completed to determine if the area is acceptable for reoccupancy by unprotected personnel. The question to be answered by the clearance dust sample data is "are the levels below applicable clearance criteria." The data will be used to determine if the work area is "clean" or if certain areas or components need to be recleaned and retested.

17.1.1.2 Level of confidence needed

With any type of sample collected there will be a discrepancy between the measured and the true concentration, which occurs as a result of random sampling error, analytical error, and random environmental fluctuations. Basically, the more samples that are collected, the more likely the measured concentration will represent the actual concentration. There are statistical methods that can be used prior to collecting samples to determine how many samples should be collected to achieve a desired level of confidence. Typically a 95% confidence level is considered acceptable for most environmental sampling situations.

For example, Appendix A-12 of the HUD Guidelines addresses the statistical rationale for the number of units to be inspected for lead-based paint in multifamily housing. The basic specification of the sampling scheme is that it achieves 95% confidence. Suppose one follows this sampling scheme and tests for lead-based paint in 100 units, and finds all surfaces tested are below 1 mg/cm^2 lead in paint. The inspector may state with 95% confidence there was no lead-based paint found. Put another way, the inspector may conclude that at least 95 of the 100 units do not have lead-based paint.

17.1.1.3 Reporting requirements for data

How the data will be reported should be determined before sampling is conducted. Issues to be considered regarding reporting the data include the following:

- Format of the data
- Frequency of data reporting
- Regulatory requirements
- Contractual requirements
- Other supporting information

As a general rule the data should be reported in a concise summary format, followed by detailed information. The summary usually contains the following information:

- Date of sampling
- Type of samples collected
- Location of each sample
- Description of each sample
- Sample results

The detailed information will include the same information plus additional data. The additional data will usually include the following:

- Who collected the samples
- Time of sample
- Chain-of-custody form
- Calibration data, as needed
- Name and address of the laboratory (if applicable)
- Who performed any analyses
- Results of blank and quality control samples
- Diagram showing sampling locations
- Which standard methods were used
- How sample locations were selected
- Accreditation/certification information for sampling and analytical personnel/organization(s)

The frequency of data reporting depends on the need for information. On some lead hazard abatement projects it may be necessary or desirable to report air sampling or dust sampling results on a daily (within 24 hours) basis. For periodic dust wipe sampling the frequency of sampling and reporting may be every 3 months, 6 months, or annually.

How the data is reported may be dictated, at least to some extent, by regulatory or contractual requirements. Samples collected for compliance with the OSHA lead standard(s) will need to be expressed as 8-hour, time-weighted averages (TWAs). One contract might require paint chip analyses to be expressed as milligrams per square centimeter. Another

contract might require the data be expressed as percent by weight.

Other supporting information for the data reported should include any deviations from the standard sampling or analytical methods used. An explanation should be provided stating the reason(s) why changes were made.

The information provided by the report should allow another professional to repeat the sampling and analysis. Assuming the environmental conditions remained the same, similar results should be obtained.

17.1.2 Sampling and analysis plan

The sampling and analysis plan is usually prepared by the sampling organization in consultation with the laboratory. The written plan describes the purpose of the sampling and contains the following information:

- Standard methods that will be used to collect and analyze the samples
- How many samples will be collected
- Sampling locations, or how the locations will be selected in the field
- Information to be recorded for each sample collected (e.g., sample number, date, time, location, description)
- Sample handling and shipping procedures, including chain-of-custody
- Which laboratory or laboratories will perform the analyses (if applicable)
- Any special safety and health precautions necessary (e.g., safety glasses, gloves, respirator)
- How results will be reported
- Quality control samples to be collected, including type and frequency

It is advisable to develop a separate sampling and analysis plan for each type of sampling performed. While this is not required, it is often less confusing. The length and complexity of each plan depends on the size of the sampling effort and the data to be gathered. The plan to characterize paint in one room prior to a maintenance task may consist of only a few sentences. A plan to measure lead in soil throughout a housing development will likely be quite lengthy.

17.1.2.1 Regulatory sampling requirements

Often sampling and analysis is conducted to determine compliance with a federal, state, or local regulation. The EPA regulations at 40 CFR 745.65 have specific criteria for lead-based paint hazards based on lead in dust concentrations and soil lead concentrations. Sampling and analyses conducted for compliance with these requirements must be performed in accordance with the procedures specified by the regulations. The regulations will also dictate the qualifications of both the person collecting the samples and the laboratory performing the analyses.

The OSHA lead regulations also mandate certain sampling and analyses be performed. For air samples, personal sampling must be conducted to measure exposures and determine compliance with the action level or permissible exposure limit. OSHA also does not recognize XRF as adequate to measure lead in paint, which may be disturbed by construction, renovation, or maintenance activities. In many sampling situations the ASTM sampling and analytical methods described later in this chapter are appropriate. For regulatory compliance, the methods required by the regulation(s) should be used.

17.1.2.2 Selection of valid standard methods

Valid standard methods should be used whenever possible. Standard methods are developed by government agencies and standards organizations. They have been peer reviewed and published. "Valid" standard methods have been tested (validated) for their designed purpose, and over the range of their intended use. Most current standard methods useful for managing lead hazards are listen in section 17.2 of this chapter.

17.1.2.3 Quality control

Persons conducting sampling and analyses should follow recognized quality control procedures for the methods performed. The specific quality control procedures for each sampling effort should be specified in the sampling plan. Quality control methods followed in the laboratory during the analysis are specified in the standard analytical method employed.

Some common types of quality control samples collected are blank samples, split samples, and field-spiked samples.

Blank samples are submitted to the same conditions as other samples in the field, but do not contain any sample. These are collected, transported and analyzed along with the other samples. The purpose of these samples is to check for systematic contamination of samples by lead in the batch of samples submitted.

Split samples are prepared by separating a sample into two equal parts. If both parts are sent to the same laboratory, it is a check for intralaboratory variability. If the two parts are sent to different laboratories, it is a check for interlaboratory variability. With the assumption the results should be the same (or very similar), split samples provide valuable

information about the quality of the data produced from the sampling effort.

Field spiked samples are sometimes appropriate for water and soil sampling. This technique involves adding a known amount of lead to a blank sample of the same type of media (i.e., soil or water). The spiked samples are submitted with the other samples for analysis by the laboratory. The percent lead recovered is calculated based on the amount known to be added and the amount found.

Additional quality control samples are prepared in the laboratory. These may include laboratory blanks, recovery samples, and standard addition samples. These results are used by the laboratory to check the quality of the data produced by the analyses.

The results of the quality control samples are reviewed to determine if they are within published ranges for the method(s) employed. For some methods it may be appropriate to correct the results based on the quality control sample findings. If the quality control samples are not in the expected range of acceptance an investigation should be performed to determine why. It will sometimes be necessary to repeat the sampling and/or analyses once the problem is identified.

17.1.2.4 Documentation and chain-of-custody using ASTM Guide D 4840 and Practice E 1864

The ASTM Standard Guide for Sampling Chain-of-Custody Procedures (D4840) provides information and guidance for maintaining a sample chain-of-custody. It is intended as guidance only. For any given sampling effort the chain-of-custody is the paperwork that demonstrates the integrity of the sample has not been compromised between the time of collection and receipt at the laboratory.

The example chain-of-custody documents in ASTM D 4840 can accommodate over 100 pieces of information. This is unnecessary and often leads to errors due to transcription of voluminous information not needed by the laboratory, and often not desirable. The critical information that must be on the chain-of-custody documentation is as follows:

- A list of each sample in the shipment
- Name, affiliation, and signature of the person collecting the samples
- Date(s) the samples in the shipment were collected and transferred
- Name, affiliation and signature of each person taking receipt of the sample with date and time received (common carriers excepted)
- Condition of the sample as received by each recipient

ASTM Standard Practice E 1864 provides general guidance on the quality of documentation and records. Section 11 provides general guidance on instrument calibration and the use of field test methods. Sections 12 and 13 provide guidance on the selection of sampling procedures and sample handling techniques.

17.2 Sampling and Analytical Methods/Procedures

17.2.1 Paint chip sampling and analysis

E 1729
Standard Practice for Field Collection of Dried Paint Samples for Lead Determination by Atomic Spectrometry Techniques

This practice covers the collection of dried paint samples or other coatings from buildings and related structures. These samples are collected in a manner that will permit subsequent digestion and determination of lead using laboratory analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Absorption Spectrometry (GFAAS).

E 1645
Standard Practice for the Preparation of Dried Paint Samples for Subsequent Lead Analysis by Atomic Spectrometry

This practice covers the sample preparation procedures for paint samples that are collected during the assessment or abatement of lead hazards in and around buildings and related structures. In addition, the practice describes the digestion procedures for paint samples to be analyzed for lead content.

E 1613
Standard Test Method for Analysis of Digested Samples for Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption (FAAS), or Graphite Furnace Atomic Absorption (GFAAS) Techniques

This test method is intended for use with digested samples that were collected originally during the abatement of lead hazards from buildings and related structures. This standard covers the lead analysis of sample digestates (for example, digested paint, soil, dust, airborne, particulate) using ICP-AES, FAAS, and GFAAS techniques.

17.2.2 In field lead analysis

E 1775
Standard Guide for Evaluating Performance of On-Site Extraction and Field-Portable Electrochemical or Spectrophotometric Analysis for Lead

This standard provides guidelines for determining the performance of field-portable quantitative lead analysis instruments. It applies to field-portable electroanalytical and spectrophotometric (including reflectance and colorimetric) analyzers. Sample matrices included are paint, dust, soil, and airborne particulate.

E 1979
Standard Practice for Ultrasonic Extraction of Paint, Dust, Soil and Air Samples for Subsequent Determination of Lead

This practice describes an ultrasonic extraction procedure for the extraction of lead from environmental samples of interest in lead abatement and renovation (or related) work, for analytical purposes. In contrast with hot plate or microwave digestion techniques, ultrasonic extraction is field-portable, which allows for on-site sample preparation.

E 2051
Standard Practice for the Determination of Lead in Paint, Settled Dust, Soil and Air Particulate by Field-Portable Electroanalysis

This practice covers the analysis of extracts of environmental samples for lead content using field-portable electroanalytical devices.

17.2.3 Chemical spot test kit measurements

E 1753
Standard Practice for the Use of Qualitative Chemical Spot Test Kits for Detection of Lead in Dry Paint Films

This practice covers the use of commercial spot test kits based on either sulfide or rhodizonate. It can be used for the qualitative determination of the presence of lead in dry paint films. This practice may be used as a qualitative procedure for other dry coating films such as varnishes. In addition, this practice provides a list of the advantages and limitations of chemical spot test kits based on sulfide and rhodizonate to allow the user to choose the appropriate spot test for a given circumstance.

E 1828
Standard Guide for Evaluating the Performance Characteristics of Qualitative Chemical Spot Test Kits for Lead in Paint

This guide describes the evaluation procedure for the determination of performance characteristics of qualitative chemical spot test kits for lead, as applied to dry paint films, for a given dry paint film matrix on a given substrate. This guide may be used to determine the performance characteristics of a given lead spot test kit for a given synthetic or real-world dry paint film matrix, independent of substrate effects.

17.2.4 Dust wipe sampling

E 1728
Standard Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques

This practice covers the collection of settled dusts on hard surfaces using the wipe sampling method. These samples are collected in a manner that will permit subsequent digestion and determination of lead using laboratory analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Absorption Spectrometry (GFAAS).

E 1792
Standard Specification for Wipe Sampling Materials for Lead in Surface Dust

This specification covers requirements for wipe materials that are used to collect settled dusts on hard surfaces for the subsequent determination of lead.

E 1644
Standard Practice for Hot Plate Digestion of Dust Wipe Samples for the Determination of Lead by Atomic Spectrometry

This practice covers the acid digestion of settled dust samples (collected using wipe sampling practices) and associated quality control (QC) samples for the determination of lead using laboratory atomic spectrometry analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Atomic Absorption Spectrometry (GFAAS).

17.2.5 Vacuum dust sampling

E 1973
Standard Practice for Collection of Surface Dust by Air Sampling Pump Vacuum Technique for Subsequent Lead Determination

This practice covers the vacuum collection of surface dusts onto filters using portable, battery-powered, air sampling pumps. Samples collected in this manner allow for the subsequent digestion and determination of lead content by using atomic spectrometric (or equivalent) methods.

17.2.6 Soil sampling for lead

E 1727
Standard Practice for Field Collection of Soil Samples for Lead Determination by Atomic Spectrometry Techniques

This practice covers the collection of soil samples using coring and scooping methods. Soil samples are collected in a manner that will permit subsequent digestion and determination of lead using laboratory analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Absorption Spectrometry (GFAAS).

E 1726
Standard Practice for Sample Digestion of Soils and the Determination of Lead by Atomic Spectrometry

This practice covers drying, homogenization, and acid digestion of soil samples and associated quality control (QC) samples. A hot plate type method for the determination of lead is used in conjunction with laboratory atomic spectrometry analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Atomic Absorption Spectrometry (GFAAS).

17.2.7 Water sampling for lead

D 3559
Standard Test Methods for Lead in Water

These test methods cover the determination of dissolved and total recoverable lead in water and wastewater by atomic-absorption spectrophotometry and differential pulse anodic stripping voltammetry.

E 1726
Standard Practice for Sample Digestion of Soils and the Determination of Lead by Atomic Spectrometry

This practice covers drying, homogenization, and acid digestion of soil samples and associated quality control (QC) samples using a hot plate type method for the determination of lead using laboratory atomic spectrometry analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Atomic Absorption Spectrometry (GFAAS).

D 5463
Standard Guide for Use of Test Kits to Measure Inorganic Constituents in Water

This guide covers general considerations for the use of test kits for quantitative determination of analytes in water and wastewater. Test kits are available from various manufacturers for the determination of a wide variety of analytes in drinking water, surface or ground waters, domestic and industrial feedwaters and wastes, and water used in power generating and steam raising.

17.2.8 Air sampling for lead

E 1553
Standard Practice for Collection of Airborne Particulate Lead During Abatement and Construction Activities

This practice covers the collection of airborne particulate lead during abatement and construction activities. The practice is intended for use in protecting workers from exposures to high concentrations of airborne particulate lead. This practice is not intended for the measurement of ambient lead concentrations in air.

E 1741
Standard Practice for the Preparation of Airborne Particulate Lead Samples Collected During Abatement and Construction Activities for Subsequent Analysis by Atomic Spectrometry

This practice covers the preparation of airborne particulate samples collected during the abatement of lead hazards in and around buildings and related structures. This standard describes the digestion procedures for airborne particulate lead samples that are collected on cellulose ester membrane filters during abatement and construction activities. The practice is intended for use with airborne particulate lead samples that are prepared for subsequent analysis by laboratory-based quantitative analytical methods.

NIOSH Methods 7300 & 7082

Both NIOSH Methods are used for the determination of lead content in air samples. NIOSH 7300 utilizes Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), and is appropriate for the determination of a variety of metals. NIOSH 7082 utilizes Flame Atomic Absorption Spectrometry for analysis.

OSHA Methods ID-121 & ID-125G

Both OSHA Methods are used for the determination of lead content in air samples. OSHA ID-125G utilizes Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), and is appropriate for the determination of a variety of metals. OSHA ID-121 utilizes Flame Atomic Absorption Spectrometry for analysis.

17.2.9 Waste analyses for EPA 40 CFR 261 determination

E 1908
Standard Guide for Sample Selection of Debris Waste from a Building Renovation or Lead Abatement Project for Toxicity Characteristic Leaching Procedure (TCLP) Testing for Leachable

This guide describes a method for selecting samples from the debris waste stream created during demolition, renovation, or lead abatement projects. The lead toxicity of the waste is then determined by analysis of the leachate resulting from use of the Toxicity Characteristic Leaching Procedure (TCLP).

Title 40, Code of Federal Regulations (CFR), Part 261, Appendix II-Method 1311, Toxicity Characteristic Leaching Procedure (TCLP)

This method describes the laboratory techniques for the determination of the lead content in the leachate from lead abatement waste.

HUD Guidelines, Chapter 10

HUD Guidelines, Chapter 10, discusses the analysis required to determine if lead waste is considered hazardous. Lead waste, which is less than 5 parts per million (milligrams/liter) as determined by the Toxicity Characteristic Leaching Procedure Test (TCLP) is considered non-hazardous.

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