VIRGINIA DEPARTMENT OF HEALTH

ENVIRONMENTAL INTERVENTION BLOOD LEAD INVESTIGATION MANUAL

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VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

INTRODUCTION

Lead, its use and misuse, has been well documented in the annals of history. It figured prominently in the fall of the Roman Empire, and it continues to be a subject of vital interest in modern times. Lead is ubiquitous in the environment. Lead can be found in paint, dust, soil, air and water; however, the dust from lead based paint is the main source of lead poisoning in children. Lead poisoning is a silent disease that can cause serious health consequences for children because of its detrimental effects on both physical and mental development. Nearly one million children in the country have dangerous levels of lead in their bloodstream.

In children, lead poisoning is most often acquired in a home. As previously stated, the primary source of lead in homes built before 1978 is lead containing dust. This is the year lead-based paint was banned for residential use by the United States Consumer Product Safety Commission. Greater lead burdens are found in homes built before 1950. Deteriorated paint and paint on friction and impact surfaces contribute to lead dust content in common household dust. As very young children crawl across floors, touch window sills and other horizontal surfaces, or play on porches or contaminated bare soil areas, they pick up lead dust on their hands, which is ingested when they eat without thoroughly washing their hands and through hand to mouth activity. This hand to mouth activity is the most common way children become lead poisoned.

Renovation and remodeling activities which disturb lead-based paint by sanding or scraping also contribute significantly to the lead content in household dust. If airborne dust particles are inhaled, the amount of lead absorbed into the bloodstream is up to seven times greater than the amount absorbed by ingestion. Painted toys and non-paint sources such as imported lead-glazed pottery, imported plastic mini blinds, ethnic cosmetics, food and medicinal compounds, and hobbies using lead also can lead to lead poisoning. Family members can also bring lead into the home through contamination at work.

Children under age six and pregnant women are most at risk for lead poisoning. Children between one and three years of age comprise seventy percent of cases involving lead poisoning, with the highest incidence of lead poisoning occurring among two-year-olds. Due to their relatively small body size and high rate of intestinal absorption, lead can accumulate quickly in the child's body, and depending on the severity of the exposure, can cause damage to the body and developing nervous system.

When lead enters the body, either by ingestion or by inhalation, it is carried throughout the system. Lead poisoning is largely asymptomatic. When there are clinical symptoms, they can be vague and suggestive of other childhood illnesses. Clinical symptoms include loss of appetite, irritability, stomachache, apathy, clumsiness and vomiting. There is also a high incidence of iron deficiency anemia in children with lead poisoning. When the body is lacking sufficient iron and calcium, it more readily absorbs lead from the gastro-intestinal tract. A good overview of the effects of lead poisoning can be found in the pamphlet, "What Everyone Should Know about Lead Poisoning." This

pamphlet can be acquired from the Lead Safe Virginia Program.

Remediation of lead poisoning involves both medical and environmental interventions. The family should receive nutritional counseling to promote a diet high in iron and calcium and low in fat. Environmental Intervention consists of identifying and remediating the source of exposure. Depending on the blood lead level, the child may need to be relocated away from the source and/or receive chelation treatment. Virginia has Regional Treatment Centers listed in the Guidelines for Childhood Lead Poisoning Screening in Virginia, where expert medical advice can be obtained. The toll free number for support and advice for lead poisoning is 1-866-767-5323. There is a physician available 24 hours a day; 7 days a week for medical advice.

It has been almost thirty years since the inception of childhood lead poisoning prevention programs in this country, and still much remains to be done to resolve the problem of lead based paint hazards in dwellings. There are approximately 1.8 million dwellings in Virginia that were built before 1980. Many of these houses still contain many layers of lead paint, and the lead dust in those homes is a major source of lead exposure. There is inadequate prevention of re-exposure to lead, and therefore, a high incidence of recurrence of lead poisoning exists among children. Lead poisoning is the number one environmental hazard for children and is totally preventable. The national goal is to eliminate childhood lead poisoning as a health hazard in the United States by the year 2010.

Federal initiatives which promote primary prevention are grants awarded by the Department of Housing and Urban Development (HUD) for abatement of privately owned properties, the Environmental Protection Agency's (EPA) development of standards for certification of supervisors, contractors, inspectors, risk assessors, project designers, and workers involved in lead abatement, and the CDC's issuance of grants for support of state and local lead programs. In October 1992, the Residential Lead-Based Paint Hazard Reduction Act (Title X) was signed into law. This has prompted changes that affected property owners, landlords, lenders, realtors, insurers, parents, tenants, abatement contractors, inspectors, laboratories, trainers, home remodelers, and state and local government agencies.

Historically, state and local public health agencies have taken the leading role in providing services to lead poisoned children. The charge to public health agencies, as described in the 1991 CDC Statement, is to provide a comprehensive, multi-faceted approach to the eradication of childhood lead poisoning, which includes screening and surveillance, risk identification, primary prevention activities, inter-agency coordination and services for poisoned children. Virginia has developed a strategic plan to eliminate lead poisoning as a health hazard in children by 2010. This was a collaborative activity involving various state and federal agencies, local parent groups, local housing authorities, and medical providers.

There are five major components of an effective lead poisoning prevention program:

1. Epidemiology/ Surveillance
2. Education of the public about the preventing lead poisoning
3. Screening of children
4. Clinical management and care coordination
5. Environmental investigation and remediation

The Virginia Department of Health is committed to providing leadership in the development of these activities and to providing opportunities for training based on the latest research for public health officials in environmental investigation and remediation of lead poisoning. This guide for the investigation of environmental lead hazards has been written with these objectives in mind.

Updates and additions to this manual will be distributed and posted on the internal VDH website as new information becomes available. Questions, comments, and suggestions may be addresses to the Virginia Department of Health's Lead Safe Virginia Program.

OBJECTIVES:

To provide public health officials, primarily Environmental Health Specialists (EHS) throughout the Commonwealth of Virginia with a manual that will enable them to:

1. Be informed and educated about the dangers of lead.
2. Be supportive of and committed to primary prevention efforts to eliminate childhood lead poisoning in the United States by the year 2010
3. Identify environmental lead hazards.
4. Educate the public on how to remediate lead based paint hazards in the safest, most effective manner possible.
5. To provide a tool to better assist families for resources to make their homes lead-safe.

HISTORY OF LEAD-BASED PAINT REGULATIONS

The history of lead-based paint (LBP) regulations at the federal level began in 1971 when Congress passed the Lead-based Paint Poisoning Prevention Act (LBPPPA). This act was to provide Federal financial assistance to help cities and communities to develop and function as intensive local programs to eliminate the causes of lead-based paint poisoning by detecting and addressing incidents of such poisoning. This LBPPPA act also established a federal demonstration and research program to study the extent of the lead-based paint poisoning problem and the methods available for lead-based paint removal, and prohibited future use of lead-based paint in federal or federally assisted construction or rehabilitation activities.

In 1973, amendments to the LBPPPA designated HUD the lead agency in the Federal effort to eliminate the hazard of LBP in housing. In that same year, 1973, the Consumer Products Safety Commission (CPSC) established a maximum lead content in paint of 0.5% by weight in a dry film of paint newly applied which was then lowered the allowable lead level in paint to 0.06% in 1978. In the 1980's, regulations addressing the LBP hazard in HUD housing were issued. In 1987, the Housing and Community Development Act changed the definition of the LBP hazard to include exterior as well as interior intact and non-intact painted surfaces. In 1989, HUD began to develop the first national compilation of technical protocols, practices and procedures on testing, abatement, worker protection, clean-up, and disposal of LBP in residential structures. HUD issued these guidelines on April 1, 1990, and revised them in September, 1990. The HUD guidelines were revised again in 1995 with a 1997 revision to Chapter 7.

As an awareness of the dangers of Lead based Paint hazards grew, Congress passed the "Residential Lead-Based Paint Hazard Reduction Act of 1992." This law was enacted as Title X of the Housing and Community Development Act of 1992 (P.L. 102-550), and was approved on October 28, 1992. It is, therefore, commonly referred to as **"**Title X**".** This legislation is much more comprehensive and practical than previous laws in many ways. It focuses on the reduction of lead paint hazards rather than the removal or covering of all lead paint. It also commits the federal government to prevention by establishing public education and outreach activities to include a national hotline and information clearinghouse. The federal government also offers grant funds to cities and states for lead poisoning prevention activities. Title X also assures quality control and

protection of occupants and workers through requirements for training and certification/licensure. It directs HUD to revise its guidelines to address risk assessments, inspections, interim controls, and abatement.

A most significant difference between Title X and previous federal legislation is its shift to reliance on market forces rather than government enforcement to achieve lead paint hazard reduction in private housing. The primary tool for this is the disclosure of information concerning lead upon transfer of residential property.

In summary, the major legislative mandates of **Title X** are:

- the **Section 402 Rule,** which established strict requirements for contractor and inspector certification and licensing;
- the **Section 403 Rule,** which defines lead-based paint hazards and dangerous levels of lead in interior surface dust and bare soil;
- the **Section 1031 Rule,** which required the **Occupational Safety and Health Administration (OSHA)** to issue final regulations on lead in the construction industry;
- **Section 406, the Renovators' and Remodelers' Disclosure Rule,** which requires disclosure of the potential for creating lead-based hazards during renovation and remodeling projects. This is also known as the Pre Renovation Rule.
- **Section 1018, the Real Estate Notification and Disclosure Rule,** which requires lead-based paint related disclosure and warning statements at the time of

sale or rental of any pre-1978 housing unit.

Pre Renovation Education Rule

On June 1, 1999, a new EPA rule requiring that homeowners and renters be notified of the dangers of lead paint dust and debris during renovations went into effect. This new regulation, the Lead Pre-Renovation Lead Hazard Education Rule, requires painters, contractors, carpenters, property management companies and others involved in remodeling or renovation of pre-1978 housing to notify homeowners and renters of the dangers of dust and debris from lead pant uncovered during this kind of work. Notification/education required by the Lead Pre-Renovation Hazard Education Rule is completed when anyone performing renovation for compensation distributes the pamphlet entitled, *Protect Your Family from Lead in Your Home* to their customers and receives verification of receipt. The rule also requires contractors to tell residents of the start and end dates of renovation and nature of the work being done, and to obtain written acknowledgment that notification was made. This rule applies if more than two square feet of paint is being disturbed. For copies of the Federal pamphlet, *Protect Your Family from Lead in Your Home*, the Federal Rule, or information on the hazards of lead paint, call 1-800-424-LEAD or via the Internet at www.epa.gov/lead.

DISCLOSURE OF LEAD-BASED PAINT HAZARDS

§ 36-107.1. Sale of residential structure with lead-based paint levels exceeding Code standards; penalty. Whenever any property owner has been notified by local building officials or representatives of local health departments that any residential

premise has levels of lead-based paint in violation of the Uniform Statewide Building Code (§ 36.97 et seq.), or has received the results of a lead inspection and/or risk assessment, such property owner shall notify prospective purchasers in writing of the presence of unacceptable levels of lead-based paint in such premises and the requirements concerning the removal of the same. Such notification shall include a copy of any notice the property owner received from local building officials or representative of local health departments advising of the presence of unacceptable levels of lead-based paint in such premises.

The notice required herein shall be provided to prospective purchasers prior to the signing of a purchase and sales agreement or, if there is no purchase or sales agreement, prior to the signing of a deed. The requirements shall not apply to purchase and sales agreements or deed signed prior to July 1, 1991. Transactions in which sellers have accepted written offers prior to July 1, 1991, but have not signed a purchase or sales agreement or a deed prior to July 1, 1991, shall be subject to the notice requirements.

Any person who fails to comply with the provisions of this section shall be liable for all damages caused by the failure to comply and shall, in addition, be liable for a civil penalty not to exceed $1,000. (1991, c. 266)

The following language is to be included in all inspections and/or risk assessment reports, or other correspondence with the building owners or other responsible parties:

The Federal Residential Lead-Based Paint Hazard Reduction Act of 1992, 42 U.S.C. 4852d, requires sellers and landlords of most residential housing built before 1978 to disclose all available and reports concerning lead-based paint and/or lead-based paint hazards, ***including the test results contained in this notice****, to purchasers and tenants at the time of sale or lease or upon lease renewal. This disclosure must occur even if the hazard reduction or abatement has been completed. Failure to disclose these test results is a violation of the U.S. Department of Housing and Urban Development and the U.S. Environmental Protection Agency regulations at 24 CFR Part 35 and 40 CFR Part 745 and can result in a fine of up to $11,000 per violation. To find out more information about your obligations under federal lead-based paint requirements, call 1-800-424-LEAD.*

Childhood Lead Poisoning Prevention Program

The Commonwealth of Virginia has established the regulatory structure necessary to conduct many types of activities in the prevention and identification of childhood lead poisoning. The general authority vested in the Virginia Department of Health to provide medical and environmental health services, educate the public, and abate hazards, enables the operation of the Childhood Lead Poisoning Prevention Program (CLPPP). The Virginia CLPPP, operated through the Lead Safe Virginia Program at the Virginia Department of Health, provides some technical oversight to local health districts in dealing with lead-related issues, provides fiscal administration of government grants, and is working to achieve environmental remediation with the goal of eliminating lead

poisoning as a health hazard for children in Virginia by the year 2010. The Virginia CLPPP has a key role in drafting and reviewing legislation which will prevent exposure of children to lead-based paint hazards in the future, and provides quality assurance for local health districts which implement medical and environmental care coordination of lead poisoned children, in accordance with the 2002 CDC publication *Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention.* This publication is available on the Lead Safe Virginia web page at http://www.vahelath.org/leadsafe/pubsclpp.htm. Local health districts which operate lead poisoning prevention programs conduct screening activities, care coordination of lead poisoned children, community-wide education, and are generally responsible for environmental investigation of lead hazards for children with a confirmed concentration of lead in blood ≥20 µg/dL for a single test or of 15-19 µg/dL in two tests taken at least 3 months apart. The *Guidelines for Childhood Lead Poisoning Screening in Virginia* can be found on pages 17-19 of this document and on the Lead Safe Virginia webpage at www.vahealth.org/leadsafe . Effective January 1999, all blood lead levels ≥10 µg/dL must be reported to the Virginia Department of Health, in accordance with the *Regulations for Disease Reporting and Control.*

LEGAL CONSIDERATIONS FOR ENVIRONMENTAL HEALTH SPECIALISTS

Upon notification of a child with a confirmed concentration of lead in blood ≥20 µg/dL for a single test or of 15-19 µg/dL in two tests taken at least 3 months apart, the local health district conducts an environmental investigation to determine the sources of the lead exposure by an environmental risk assessment. Any person in the

Commonwealth who conducts risk assessments for the presence of lead-based paint hazards, including health department officials, must be licensed by the Virginia Department of Professional and Occupational Regulation (DPOR) to perform such activities.

DPOR has issued *Virginia Lead-Based Paint Activities Regulations* which contain the standards for performing lead-based paint activities in Virginia, the information and procedures necessary to obtain a certification for individuals and firms that wish to perform such activities, and the accreditation requirements and process for lead-based activity training programs. The law that governs these activities is also found in Title 54.1, Chapter 5 of the Code of Virginia**.** More information can be found on the DPOR website at www.state.va.us/dpor. Each state is required to have similar regulations, in accordance with the U. S. Environmental Protection Agency's Final Rule in the Code of Federal Regulations (CFR), August 29, 1996.

Role of the Environmental Health Specialist (Health Department):

- Obtain licensure from DPOR to conduct lead-based paint risk assessments and submit detailed reports to property owners, physicians and local building officials
- Educate the property owners on the public health significance of lead-based paint exposure hazards and recommend specific remediation options
- Assure or conduct post-remediation inspection and clearance testing
- Appear in administrative hearings and in court as an expert witness.

Trial Issues

What is "proof"? Generally, proof is any information that will assist the finder of fact in its deliberation. Photographs of the scene, with paint flaking on the ground, are excellent examples of proof. A simple narrative of observations is proof that those events did in fact occur. Physical samples of paint chip, dust, soil and water samples taken from the scene are highly persuasive, but to be admissible, chain of custody must be maintained." Establishing the chain of custody is a prerequisite to the admission of testimony. With the chain of custody established for samples submitted to the lab the laboratory expert who analyzed the sample can accurately testify to its lead content.

A chain of custody form should be used in order to admit into evidence any physical item, e.g., paint samples, so that the court can be assured that the integrity of the evidence has been secured. This means that the chain of custody must identify each person who had physical possession of the evidence, and each individual must be available to testify that there was no tampering of the evidence while it was in their possession. This also means that the evidence must be kept in a secure location, such as a locked file cabinet, so that the possibility of anyone else tampering with it is reduced. If the chain of custody is properly maintained in accordance with EPA protocols, the chemist will be able to testify as to the veracity of the analytical results. Otherwise, with improper chain of custody, the test results will be inadmissible as court evidence. Any questions concerning establishment of proper chain of custody can be referred to the QA/QC officer at the NLLAP accredited laboratory.

A chain of custody is not needed for paint concentrations measured by an XRF. In order to be admissible, the person operating the unit must be able to testify that: (1) the instrument was working properly at the time of the field test; and (2) the person knew how to operate the instrument properly. Note also that it is very helpful if the instrument has a read-out that corresponds to the legal standards directly, without requiring a conversion to a different unit.

A full understanding of legal liability requires an understanding of the background of legal considerations regarding lead poisoning. Childhood lead poisoning is an arena fraught with many complexities, both legal and technical.

Heightened public awareness and litigation of cases of lead poisoning, the still-evolving standard of care for risk assessment, the developing nature of risk assessment and heavy reliance upon the judgment, knowledge, and skill of the person performing risk assessments all present potential legal liabilities for the individual performing lead hazard evaluations. Avoidance of legal liability turns on those professionals fulfilling four legal duties owed to society. The four legal obligations are **"**the duty of reasonable care**"** which is the ability to foresee of harm to others that arises from a consultant's or contractor's activities, the legal obligation is to protect others from such harm, the "duty to warn**"** requires that others be adequately advised of potential hazards that can cause injury or damage, the "duty to be informed**"** refers to the need to keep abreast of the latest scientific information, discoveries, procedures, products, and regulations that affect or govern one's chosen field., and the "duty to test**"** requires that one evaluate and ascertain

potential hazards to which third parties can be exposed."

Risk assessment for identifying lead hazards is a discipline which characterizes the relative safety of a dwelling in terms of lead hazards associated with the residence, and identifying lead hazard reduction measures suitable for the residence. This involves consideration of the condition and location of lead-based paint, occupancy use patterns, and other building conditions which would cause the failure of paint.

Deciding the appropriate action to take in response to a reported elevated blood lead level:

The Virginia *Guidelines for Lead Poisoning Screening in Virginia: Management of Children with Confirmed Elevated Blood Lead Levels* are to be followed by local health department personnel. These follow CDC guidelines as required by the Virginia regulations amended 2003.

Guidelines for Childhood Lead Poisoning Screening in Virginia

SCREENING/RISK FACTOR QUESTIONS

Blood lead levels shall be obtained in children at ages 1 and 2 if they meet ANY one of the criteria noted in the box below. In addition, children ages 3-5 years of age who have not previously been tested and meet ANY one of the criteria in the box below shall also be tested.

1. Eligible for or receiving Medicaid, or WIC benefits?
2. Living in a ZIP code determined to be high risk based on age of housing and other factors? (see attached High –Risk ZIP Code list)
3. Living in or regularly visiting a house or day care center built before 1950?
4. Living in or regularly visiting a house built before 1978 with peeling or chipping paint or recent (within the last 6 months), ongoing or planned renovation?
5. Living with or regularly visiting a sibling, housemate or playmate with lead poisoning?
6. Living with an adult whose job or hobby involves exposure to lead?
7. Living near an active lead smelter, battery recycling plant, or other industry likely to release lead?

- Take careful history regarding possible lead exposure at each routine visit.
- A child must be tested if the parent or guardian requests testing due to possible exposure.
- Provide nutrition and risk reduction educational materials for parents (see 2002 CDC Case Management Manual available on the CDC or the VDH Lead-Safe Virginia Web pages).
- Screening may be performed by venipuncture or capillary. Filter paper methods are also acceptable. The use of the hand held testing machines must be approved through the Lead-Safe Virginia Program at 804-864-7694 to assure proper quality assurance and reporting of data.

CONFIRMATION OF SCREENING RESULTS

If result of capillary screening test (µg/dL) is:	**Perform diagnostic test on venous blood *within:***
10-19	3 months
20-44	1 month - 1 week (The higher the screen, the sooner the diagnostic test should be performed.)
45-59	48 hours
60-69	24 hours
≥70	Immediately as an emergency lab test

- Confirm elevated capillary blood lead levels ≥10 µg/dL.
- A second capillary is allowable if performed within 12 weeks.

  A venous sample is considered "confirmed".
- Virginia regulations require reporting of blood lead levels ≥10 µg/dL (using the EPI-1 form) to the Office of Epidemiology. Regulations effective July 1, 2001 require laboratories to report all blood lead tests on children under the age of six within ten days of analysis.

MANAGEMENT OF CHILDREN WITH CONFIRMED ELEVATED BLOOD LEAD LEVELS

BLOOD LEAD LEVEL (µg/dL)	ACTION (Case manager assures coordinated action and follow-up)
10-14	• *Lead education: Dietary and Environmental • Follow-up blood lead monitoring • Refer for WIC and social services, if needed
15-19	• *Lead education: Dietary and Environmental • Follow-up blood lead monitoring • Refer for WIC and social services, if needed. • Proceed according to actions for 20-40 ug/dL if: A follow-up blood lead level is in this range at least three months after initial venous test, **or** the blood lead levels increase
20-44	• *Lead education: Dietary and Environmental • Follow-up blood lead monitoring • Begin clinical management (complete medical evaluation, including developmental assessment). • Refer for WIC and social services, if needed • Complete history and medical exam. • Lab work to include hemoglobin or hematocrit/iron status • Environmental investigation (call local health department or Lead-Safe Virginia) • Lead hazard reduction • Medical and developmental monitoring
45-69	• *Lead education: Dietary and Environmental • Follow-up blood lead monitoring • Within 48 hours, begin clinical management including medical treatment, complete medical evaluation, and developmental assessment. For medical treatment information, contact the local health department or regional treatment center listed below. Chelation therapy. • Environmental investigation (call local health department or Lead-Safe Virginia) • Lead hazard reduction • Refer for WIC and social services, if needed.
70 and above	• Hospitalize child and begin medical treatment (chelation therapy) immediately. • Contact a regional treatment center listed below. • Proceed according to actions for 45-69 ug/dL

* Provide educational materials.

For questions related to your local area, refer to your local health department.

Regional Treatment Centers

Children's Hospital of the King's Daughters (Norfolk)	(757) 668-7179
Medical College of Virginia (Richmond)	(804) 828-7010
University of Virginia (Charlottesville)	(800) 451-1428
Children's National Medical Center (DC)	(202) 884-5000
Toll Free Emergency	(866) 767-5323

NOTE: Local knowledge can override these guidelines as determined by collaboration between the local health director and the private physician.

Developed by the Virginia Department of Health Statewide Screening Plan Work Group, following CDC Guidelines and Virginia Regulations. Funded by the Centers for Disease Control and Prevention and the Virginia Department of Health.

Upon notification of a child with a confirmed concentration of lead in blood ≥20 µg/dL for a single test, or of 15-19 µg/dL in two tests taken at least 3 months apart by a health care provider or public health nurse, the local health district conducts an environmental investigation to determine the source of the lead exposure through an environmental risk assessment. The environmental risk assessment will usually be performed by an Environmental Health Specialist (EHS). An environmental risk assessment done in response to an elevated blood lead level is called an Environmental Intervention Blood Lead Investigation (EIBLI). The recommended procedures for the an environmental investigation in response to an elevated blood lead level (Environmental Intervention Blood Lead Investigation) are contained in part in several different documents: Chapter 16 of the ***1995 HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing***, EPA's Model Curriculum for Risk Assessors, and EPA's ***Lead; Identification of Dangerous Levels of Lead*** (403 Rule). This process always includes a comprehensive questionnaire that may be found in Chapter 16 of the HUD Guidelines and in the appendix of this document which can be used to document the environmental investigation. Copies of chapter 16 can be found at:

http://www.hud.gov/offices/lead/guidelines/hudguidelines/

Copies of the EPA 403 Rule can be found at:

http://www.epa.gov/fedrgstr/EPA-TOX/2001/January/Day-05/t84.pdf

Copies of the EPA approved curriculum can be obtained from either an EPA accredited trainer, or a Virginia approved trainer who subscribes to the EPA curriculum data base.

Lead Based Paint Inspection VS. Risk Assessment

(including EIBL Investigations)

In all training programs, the lead based paint inspector course is a prerequisite for the lead based paint risk assessment course. The rationale for this is to enable the risk assessor to understand testing combinations and to understand a full inspection protocol which identifies the existence of all lead based paint. Although an inspection may locate and identify the presence of lead based paint, an inspection does not identify hazards or provide hazard reduction protocols for lead based paint hazards. As a licensed risk assessor, it is the role of the Environmental Health Specialist (EHS) to address the lead based paint hazards and to offer a lead hazard control plan in response to an elevated blood lead level by performing an Environmental Intervention Blood Lead (EIBL) Investigation for a lead poisoned child.

When performing an EIBL investigation, the public health official should follow the written policy and standard operating procedures described within this manual to ensure that all quality assurance/quality control protocols are followed. While completing an EIBL investigation, the licensed risk assessor must provide complete and comprehensive explanations of work in written form, including all possible hazards, to the client. An example of an EIBL investigation report, including a lead hazard control plan, may be found in the appendices. Copies of these reports must be maintained indefinitely.

Each health district is encouraged to have at least one licensed lead-based paint

risk assessor on staff. Funds for fees associated with training health department employees are available through the Lead-Safe Virginia Program.

MEDICAID REIMBURSEMENT FOR ENVIRONMENTAL INVESTIGATION OF LEAD HAZARDS

Health districts may obtain Medicaid reimbursement for an environmental investigation to identify the source or sources of lead exposure for a Medicaid eligible child with an elevated blood lead. For reimbursement, the child must have a venous blood lead with a confirmed concentration of lead in blood ≥20 µg/dL for a single test, or of 15-19 µg/dL in two tests taken at least 3 months apart. The reimbursement rate is $150 per household investigation for lead poisoning hazards. Only one billing is authorized per household, regardless of the number of visits

ENVIRONMENTAL HEALTH PROTOCOL FOR AN EIBL INVESTIGATION

The purpose of an elevated blood lead level investigation is to determine and report the existence, nature, severity, and location of lead hazards in a dwelling through an on-site investigation. After conducting the investigation, the EHS should provide a lead hazard control plan on possible solutions to address the hazards identified. Procedures should be done in accordance with Chapter 16 of the HUD Guidelines and the EPA 403 Rule. The standard operating procedures for sampling and the guidance information on completing an EIBL investigation, both of which are included in this document, will guide the risk assessor through the EIBL process. The risk assessor is

responsible for identifying lead hazards in the environment of a child/children under six that has/have been identified as lead poisoned; informing the owner and the tenants of an appropriate course of action to remediate/abate the lead hazards; and depending on the locality, enforcement of the code of action.

Upon receiving a referral, the EHS should have the nursing assessment form (see appendix). Depending on the BLL, schedule a time for a risk assessment. If an initial visit can be completed by the PHN, this can be most beneficial for educational purposes as well as planning for the risk assessment if the risk assessment is not scheduled the same day. In the case of a rental property, permission is not required from the property owner to perform the risk assessment.

EHS Response Time

BLOOD LEAD LEVEL	RESPONSE TIME
10-14	IF RESOURCES EXIST
15-19 (PERSISTENT)	WITHIN TWO WEEKS OF REFERRAL
20-44	WITHIN ONE WEEK OF REFERRAL
45-70	WITHIN 48 HOURS OF REFERRAL
≥ 70	WITHIN 24 HOURS OF REFERRAL

Important points to Remember:

✓ Throughout the process of an EIBL investigation, always follow HIPPA regulations.

✓ All risk assessors should be properly trained and licensed in accordance with VDPOR regulations.

✓ As a general rule, the person with possessory interest in the dwelling unit has authority to allow the public health official on the premises to conduct a risk assessment or EIBL investigation. The tenant does have the authority to let you inside their own dwelling unit without the need for the landlord's consent. Always obtain consent to enter from an adult. Any adult member of the household will do; it would not be proper to rely on the consent of a minor. Adult babysitters pose something of a special circumstance, and common sense will help identify those situations when it would be advisable to return another time. The EHS should attempt to set up a time and date with the tenant for the risk assessment prior to visiting the residence.

Laboratory Submission

All environmental samples are to be sent to Schneider laboratories in Richmond. Schneider is recognized by EPA's National Lead Laboratory Accreditation Program (NLLAP), which currently is administered by the American Association for Laboratory Accreditation (AALA) and the American Industrial Hygiene Association (AIHA). Schneider is accredited to analyze lead in soil, dust wipes, and paint. All samples are to be sent to the laboratory for analysis should be sufficiently labeled with a unique sample number, date, sampler's initials, time sample was collected, and the address or a case file number. An example of a unique sample number may include the sample type, date and

sampler's initials: DW1-08/07/04 JH-13:15. This represents dust wipe #1 collected on August 8, 2004 by John Henry at 1:15 PM. Be sure to include and complete appropriate laboratory and chain of custody forms. A sample form and chain of custody form from Schneider can be found in the appendix. The chain of custody form is important to ensure that the samples are traceable. Appropriate sampling and shipping packaging criteria should be verified with the laboratory. Samples to be submitted to Schneider can be sent to:

Schneider Laboratories

2512 West Cary Street

Richmond, VA 23220-5117

Standard Operating Procedures for Environmental Sampling

*Note: Sampling forms for environmental sampling can be found in the appendices (D, E, F, G, and H)

The goal of these standard operating procedures is to integrate the EPA and HUD guidance documents and the EPA 403 Rule to provide guidance for risk assessors in investigating the environments in which a lead poisoned child resides and/or routinely spends time. Both the EPA and HUD have published documents containing guidance for investigating the environment(s) in which lead poisoned children reside: HUD Guidelines Chapter 16: Investigation and Treatment of Dwellings Housing Children with Elevated Blood Lead Levels; and the EPA Risk Assessment Model Curriculum Section 13:

Performing Risk Assessments for Housing with Children Who Have Elevated Blood Lead Levels. More recent regulations included in the EPA 403 Rule: Lead: Identification of Dangerous levels of Lead, 2001, specify the areas which must be sampled and the minimum number of samples to take for a routine risk assessment; citing ASTM Methods E-1727-04 Standard Practice for Field Collection of Soil Samples for Subsequent Lead Determination, E-1728-03 Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination, and E-1792-03 Standard Specification for Wipe Sampling Materials for Lead in Surface Dust for sample collection techniques.

Both HUD and EPA documents describe a Risk Assessment as the starting point for an Environmental Investigation for an Elevated Blood Lead (EIBL), and both documents also state that the inspection and/or risk assessment protocols are not adequate when a lead poisoned child has been identified. HUD Chapter 16 states "The protocols in (HUD Guidelines) Chapters 5 (Risk Assessments) and 7 (Inspections) are not adequate for use in dwellings with a lead-poisoned child, since additional environmental testing and interviewing are often required." EPA Risk Assessment Model Curriculum observes, "The purpose of an EIBL investigation is to identify a cause or causes for the lead poisoning of a child. A normal risk assessment attempts to identify basic lead-based paint hazards in a dwelling, regardless of whether or not a child is poisoned." In addition to the sampling protocol necessary to meet the legal requirements specified in the EPA 403 Rule, many other sources of lead may be present and the possibility of these must be considered, and non-routine samples collected, if necessary.

The EPA 403 Rule clearly defines what constitutes lead hazards:

> *(a)Paint-lead hazard*: "A paint-lead hazard is any of the following: (1) Any lead-based paint on a friction surface that is subject to abrasion and where the lead dust levels on the nearest horizontal surface underneath the friction surface (e.g., the window sill, or floor) are equal to or greater than the dust-lead hazard levels identified in paragraph (b) of this section. (2) Any damaged or otherwise deteriorated lead-based paint on an impact surface that is caused by impact from a related building component (such as a door knob that knocks into a wall or a door that knocks against its door frame. (3) Any chewable lead-based painted surface on which there is evidence of teeth marks. (4) Any other deteriorated lead-based paint in any residential building or child-occupied facility or on the exterior of any residential building or child-occupied facility.
>
> (b) *Dust-lead hazard*. A dust-lead hazard is surface dust in a residential dwelling or child-occupied facility that contains a mass-per-area concentration of lead equal to or exceeding 40 mg/ft2 on floors or 250 mg/ft2 on interior window sills based on wipe samples.
>
> (c) *Soil-lead hazard*. A soil-lead hazard is bare soil on residential real property or on the property of a child-occupied facility that contains total lead equal to or exceeding 400 parts per million (mg/g) in a play area or average of 1,200 parts per million of bare soil in the rest of the yard based on soil samples.

ROUTINE RISK ASSESSMENT REQUIREMENTS

Paint Chip Sampling

A routine risk assessment requires sampling of all deteriorated paint in, outside and on other surfaces such as fencing, associated with the dwelling. Although both HUD and EPA prefer the use of an XRF to sample deteriorated surfaces, paint chip analysis is also allowed. The paint chip samples should be obtained according to the protocol described herein so that sample results will be reported in $mg/cm^{2,}$ Additionally, both the EPA and HUD require that all samples be analyzed by a laboratory which participates in the National Lead Laboratory Accreditation Program (NLLAP). Currently, no spot test kits or on-site wipe analysis kits have been approved by the EPA. Therefore, until such

time as the EPA approves them for use, they are unacceptable legally as part of any sampling protocol for risk assessments, including EIBL investigations.

Dust Wipe Sampling

The EPA 403 Rule requires:

"(5) In residential dwellings, dust samples (either composite or single surface samples) from the interior window sill(s) and floor shall be collected and analyzed for lead concentration in all living areas where one or more children, age 6 and under, are most likely to come into contact with dust. (6) For multi-family dwellings and child-occupied facilities, the samples required in paragraph (d)(4) of this section shall be taken. In addition, interior window sill and floor dust samples (either composite or single surface samples) shall be collected and analyzed for lead concentration in the following locations:

(7) For child-occupied facilities, interior window sill and floor dust samples (either composite or single surface samples) shall be collected and analyzed for lead concentration in each room, hallway or stairwell utilized by one or more children, age 6 and under, and in other common areas in the child occupied facility where one or more children, age 6 and under, are likely to come into contact with dust.

To summarize this, the risk assessor must collect a floor dust wipe and a window sill dust wipe in every room where children 6 years and younger are likely to spend time In multiple family dwellings, the above samples must be collected as well as a floor dust wipe sample and a window sill dust wipe sample "*in each room, hallway or stairwell utilized by one or more children, age 6 and under, and in other common areas in the child occupied facility where one or more children, age 6 and under, are likely to come into contact with dust"*. The EPA has not currently approved an analytical protocol for composite samples, therefore all samples must be collected as single surface samples.

Soil Sampling

A risk assessor must also collect soil samples for all bare soil areas. The bare soils areas must be divided into child play areas and other bare areas of the yard. The protocol for soil sampling is included in this document. The EPA 403 Rule specifically identifies bare soil as a hazard when the following conditions are met:

A soil-lead hazard is bare soil on residential real property or on the property of a child occupied facility that contains total lead equal to or exceeding 400 parts per million (mg/g) in a play area or average of 1,200 parts per million of bare soil in the rest of the yard based on soil samples.

Water Sampling

Water testing is a routine part of an EIBL Investigation. The water samples must be collected in accordance with the sampling protocol included herein. This protocol combines the requirements of the EPA Risk Assessment Model Curriculum and the EPA Safe Drinking Water Act.

The Starting Point for an EIBL Investigation

Whether or not an inspection, risk assessment, or any sampling has previously been completed, the first step in an EIBL Investigation is completion of Table 16.2 "*Resident Questionnaire for Investigation of Children With Elevated Blood Lead Levels from the HUD Guidelines*. After completing the Chapter 16 questionnaire, the risk assessor will perform a visual assessment of the dwelling to determine overall building condition and the condition of all painted surfaces. The dwelling is visually assessed by drawing a diagram of the unit, labeling rooms, and identifying doors and windows and other relevant information. Each wall should be identified as wall A, B, C, or D.

Standing inside of the unit, wall A is the wall that faces the street address for a single family residence or front entrance of the unit for multi-family housing. Walls B, C, & D are then identified clockwise from wall A. (See Diagram 1)

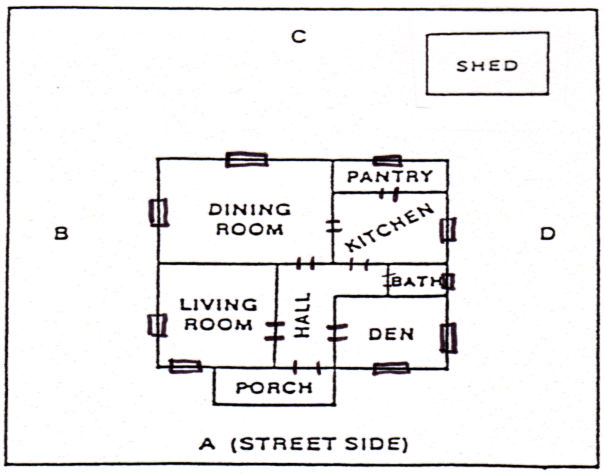


Diagram 1

A visual assessment of the building can be done using Form 5.1 "Building Condition Form" of the HUD Guidelines (see appendix). If the "Yes" column has more than two checks, the dwelling is <u>not</u> considered to be in good condition. This information may be relevant when developing hazards control options. A visual assessment of all paint surface conditions is to be completed on room by room basis noting all deteriorated surfaces, both interior and exterior. Particular attention should be paid to friction and impact surfaces and surfaces accessible and chewable to a young child. After the completion of the questionnaire and the visual assessment, environmental sampling can then be completed. It is important to note that different media (dust, paint, soil) sampling should be conducted in a specific sequence with dust wipe samples collected first. This prevents the risk assessor from contaminating the horizontal surfaces to be wiped with

debris from paint chip sampling, if destructive sampling is used to test painted surfaces. After dust wipe sampling has been completed, all other environmental samples should be taken. In addition to risk assessment required samples (deteriorated paint, dust, soil), water samples must be collected and additional samples of other materials and surfaces may be required, dependent upon information collected during the questionnaire and subject to the risk assessor's professional judgment. The HUD Guidelines state,"*The investigator is obligated to conduct a comprehensive investigation of all sources of lead in the child's environment, not just those lead exposures directly related to the child's residence. This investigation includes studying relatively uncommon sources of lead, such as glazed pottery and traditional medicines or remedies, and other dwellings or areas frequented by the child. Some of these sources may be discovered by the results of the questionnaire."*

The EPA Risk Assessment Model Curriculum states, "The investigator should conduct a comprehensive investigation of **all** sources of lead in the child's environment, not just those lead exposures directly related to the child's residence. This investigation includes studying other dwellings frequented by the child and relatively uncommon sources of lead, such as glazed pottery and traditional medicines or remedies. Some of these sources may be discovered by the results of the resident questionnaire completed with the primary care giver."

DETERIORATED PAINT SAMPLING

Methods of Measuring Lead in Deteriorated Paint Films

This section reviews issues related to deteriorated paint films only. (The assumption is that the risk assessor has been previously trained in paint film sampling and measurement procedures in the EPA inspector/risk assessor course.) All sampling records must be maintained in accordance with EPA, HUD and ASTM protocols.

The lead content in deteriorated paint films will be determined by using either portable XRF analysis or laboratory analysis (**Remember that, according to HUD and EPA, because the units cannot be reported in mg/cm², picking up paint chip samples is deemed inappropriate, if XRF or paint chip sampling as described in Chapter 7 of the HUD Guidelines can be completed.)**

Protocols are available from EPA, HUD and ASTM. ASTM standards include

- ES-28 Field Collection of Dried Paint Samples
- ES-37 Preparation of Dried Paint Samples for Laboratory Analysis
- E-1613 Standard Test Method for Analysis of Digested Samples

Selecting the Area for Analysis

When examining an area for analysis of deteriorated paint films, proper selection is essential. Spatial variation (how much the lead content changes across a given surface) on intact surfaces is known to be considerable. Across a surface with deteriorated films, the variation may be even larger, since some areas may not contain all layers.

The risk assessor should make a visual inspection to select an area in which all layers of paint film are present and in which the least amount of deterioration is apparent. For destructive laboratory analysis, an unobtrusive area is typically selected, although it is more important to make sure that all layers are present.

Examples of unobtrusive areas include

- behind pictures
- behind furniture
- near corners
- underneath protruding surfaces (mantels, window sills).

Testing Locations/Components

For each home to be inspected, all surfaces with deteriorated paint in interior rooms, common areas, and exterior areas will be tested. This includes but is not limited to hallways, foyers, stairwells, enclosed porches, outbuildings, and fences. Attics and basements are to be included if they are frequented by children. Inspecting all rooms will be beneficial for developing a hazard control plan or abatement scope of work (examples can be found in the appendices). The following descriptions are of testing combinations of building components that may be sampled should deteriorated paint be observed.

A. **Doors** (see Diagram 2)

- Door jambs, stops, casings, and transoms are tested as a single combination. Testing one of these will represent all.

- The door itself is separate from the other components and should be tested separately. For doors that separate rooms, each side of the door will need to be tested. The same is true for door casings and trim.
- Door thresholds should also be tested separately.
- All doors in a room may not need to be tested. If all appear to be the same in nature (e.g., size, material, look, etc.) select one to represent all. If there is reason to believe that each door has a different paint history or is completely different in nature, then each door should be tested separately.

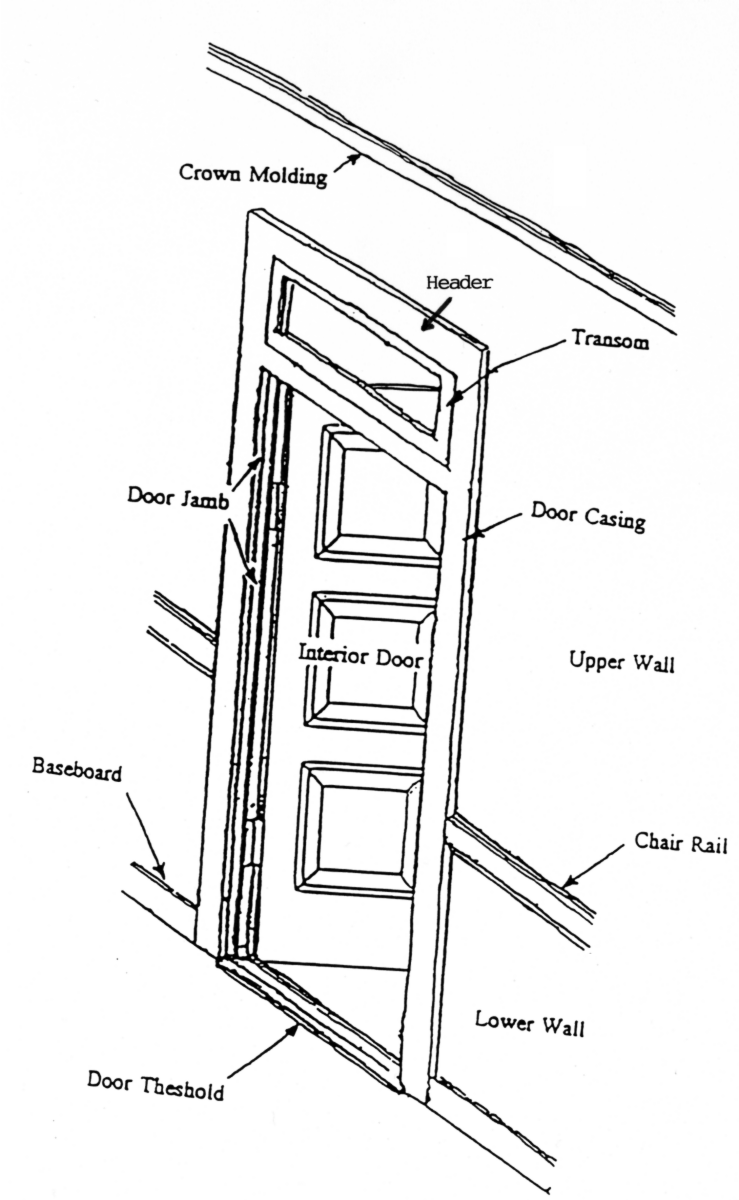


Diagram 2

B. **Windows** (see Diagram 3)

- Interior window casings, stops, jambs, sills, and aprons (all trim) are a single testing combination.

- Interior window sashes (the window portion) are separate from the other components and should be tested separately. The exterior sides of the sashes are also treated separately and should be tested with the exterior.
- All windows in a room may not need to be tested. If all appear to be the same in nature (e.g., size, material, look, etc.) select one to represent all. If there is reason to believe that each window has a different paint history or is a completely different in nature, then each window with deteriorated paint should be tested separately.

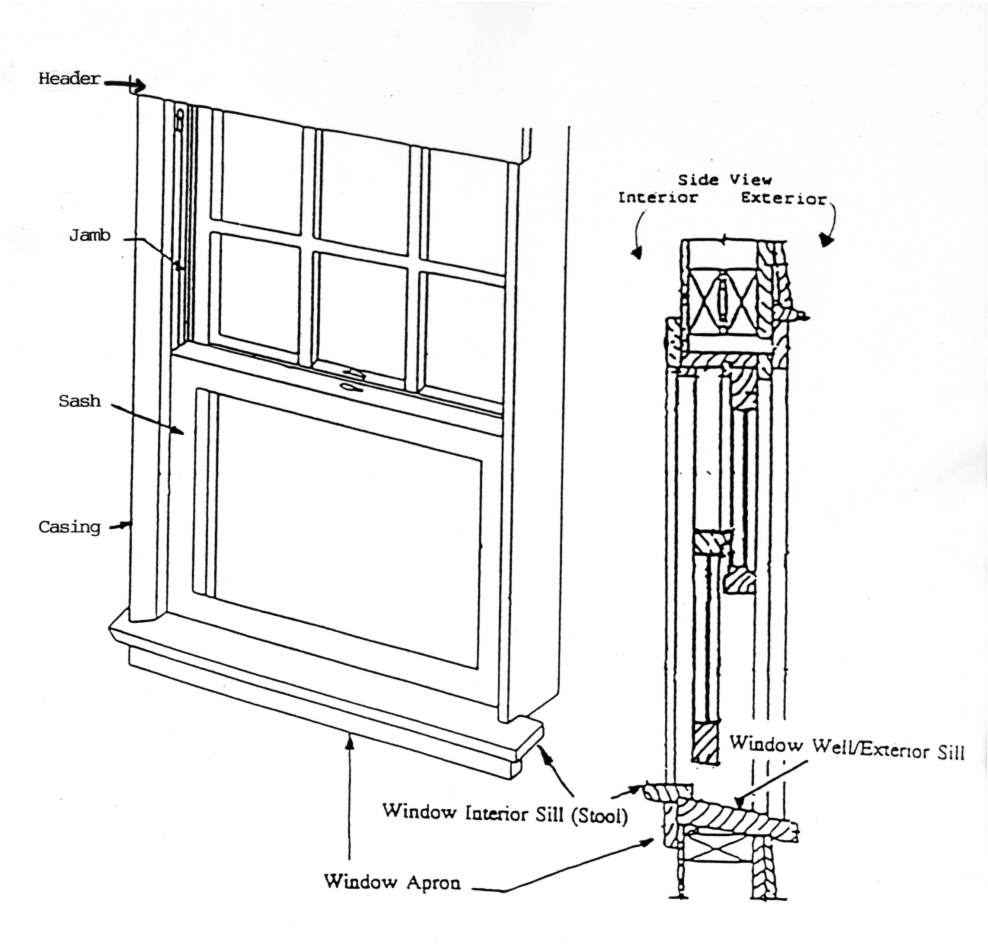


Diagram 3

C. Interior Trim

- For each room, baseboards, chair rails, crown molding, etc. should all be tested separately. However, each component will only need to be tested once, as opposed to on every wall. The only exception is if there is reason to believe that each baseboard, chair rail, or crown molding on each wall has a different paint history or is a completely different in nature, then each component should be tested separately.

D. Interior Walls

- If four walls of a room have deteriorated paint then each should be tested individually. According the Chapter 7 of the HUD Guidelines, if there are more than 4 walls within a room with the same substrate, the four readings should be averaged and the average assigned as the concentration for the rest of the walls. If the risk assessor is in doubt as to the construction dates of the different walls (when there are more than four), all walls can be tested.
- For walls that have two different types of covering, such as the upper walls having plaster and the lower walls having wood, each wall type should be tested on each wall. (Therefore, at least 8 wall readings will be taken in that room.)
- Electrical sockets, switches, and/or plates can be included as part of the wall and need not be tested individually.
- Walls covered by wallpaper can also be tested, especially if the wallpaper is in poor condition. (The property owner may be planning to take it down.) If available, the XRF should have the capability of reading the underlying paint.
- Walls with ceramic tiles can also be tested. Some ceramic tiles have been found to contain lead. The tiles are not considered a hazard as along as they are intact.

However, should the property owner plan to do renovations that would disturb the tiles, it would be beneficial for them to be aware of whether or not the tiles contain lead.

E. Floors

- Painted, shellacked, varnished, or stained floors should be tested. If the floors appear to have the same coating through out the dwelling, testing in one room can be representative of the remaining floors. If the floor coatings are different from room to room, each floor should be tested separately. If the dwelling is more than one story high, at least one floor, per coating, should be tested per story.
- Floors should be tested in areas where the coating is apparent as opposed to a more worn area such as in front of a door. Testing areas closer to walls as opposed to in the middle of the room give more accurate results of the paint history.
- Thresholds can be considered part of the door as well as the floor. It is suggested to test the thresholds separately from the floor.
- Floor coverings such as linoleum need not be tested.

F. Ceilings

- Ceilings are usually inaccessible and not tested, unless the ceiling is deteriorated and does not fit the testing combination assigned to the walls (different texture, different material or different substrate) Otherwise, it will be assumed that the ceilings are of the same nature as the walls; however, the condition of the ceiling should also be noted (e.g., deteriorated paint, water damage, etc.). If the walls are

addressed in an abatement scope of work, the ceiling may also need addressing. Having this information on hand will save time.

G. **Stairwell Components** (See Diagram 4)

- Most of the time different stairwell components will have different paint coatings. For example, the treads are likely to be painted differently than the risers. It is recommended that at least one of each component type if deteriorated paint exists be tested. These components include railing caps, lower railings, balusters, newel post, stringers, baseboards, treads, and risers.

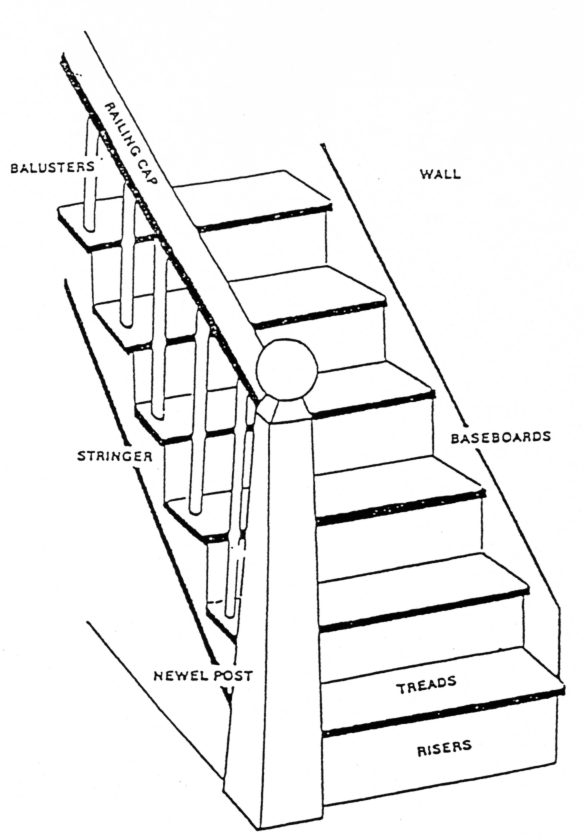


Diagram 4

H. **Closets** (See Diagram 5)

- Closets are generally not tested (with the exception of their door components). However, they should be taken into consideration when there is a child involved. This may be the area where toys are stored or even where a child plays.
- The walls, floor, or ceiling of the closet do not need to be tested unless they are obviously dissimilar from the adjoining room, or appear to be a likely exposure scenario for children. However; there may be some other components within the closet, like a lower shelf that may be accessible /chewable to a child, which should be tested if deteriorated paint exists and it is a chewable surface.

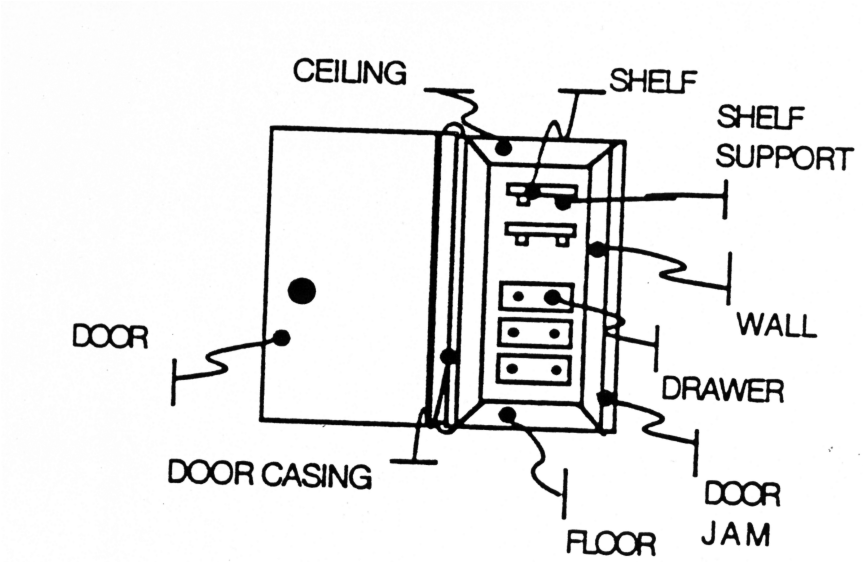


Diagram 5

I. **Furniture** (See Diagram 6)

- Painted furniture that is physically attached to the unit (e.g., built in cabinets, bookshelf, desk, etc.) should be tested as separate components. Unattached children's furniture, especially if built before 1978, may contain lead and should be tested if deteriorated paint exists or the surface is a chewable surface.

J. Miscellaneous Interior Items

Other items that should also be tested if deteriorated paint is observed and/or the child has access to these items are:

- Fireplaces, cabinets, radiators, heating units, mini-blinds, dishes, etc.

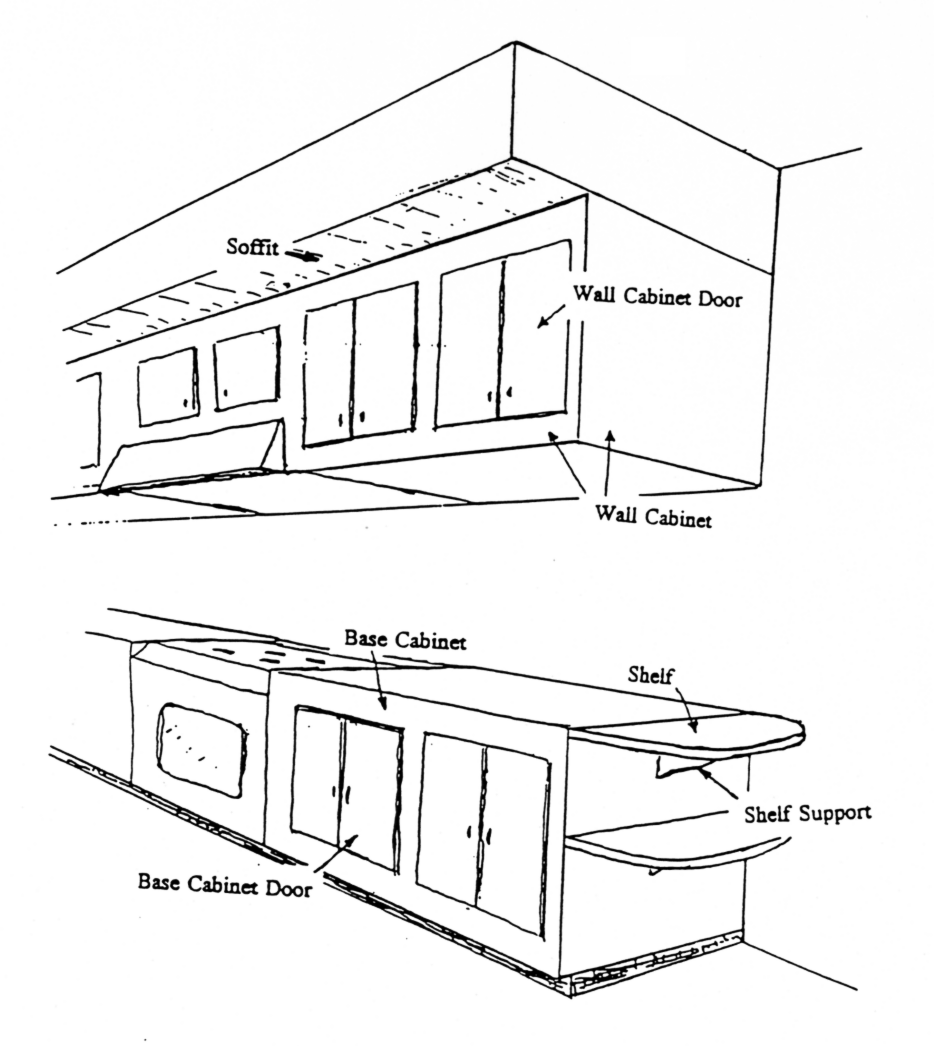


Diagram 6

K. **Exterior (**see Diagram 7-A, 7-B, & 7-C)

- Walls on all sides of the dwelling, if the surface is deteriorated, should be tested. (e.g., four for a freestanding dwelling or two for a row house) The foundation and any corner boards should also be tested, if deteriorated paint is observed.
- The exterior is considered a "room equivalent" and, if deteriorated, should be tested as such (Chapter 7 of the HUD Guidelines. Testing combination for windows, doors, window trim, door trim, staircases, etc. should be developed for all deteriorated surfaces..
- Porches: At least one of each component type should be tested. These components include the ceiling, soffits, fascias, gutters, down spouts, floor, railings, balusters, columns, steps, etc. For those components that are inaccessible (e.g., ceiling, soffit, etc.), the paint condition and any visible characteristics should be noted. If the surfaces are deteriorated, they must be sampled.

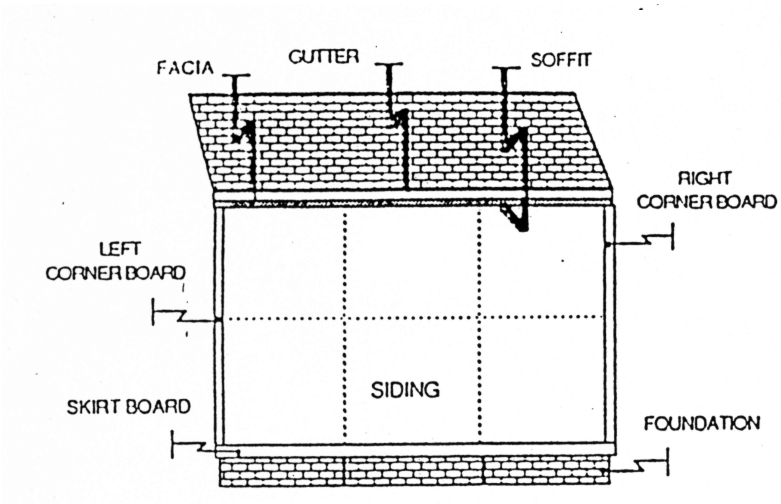


Diagram 7-A

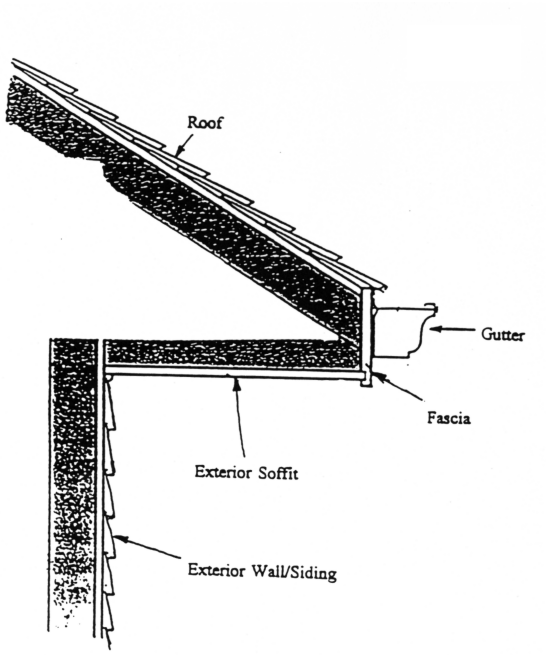


Diagram 7-B

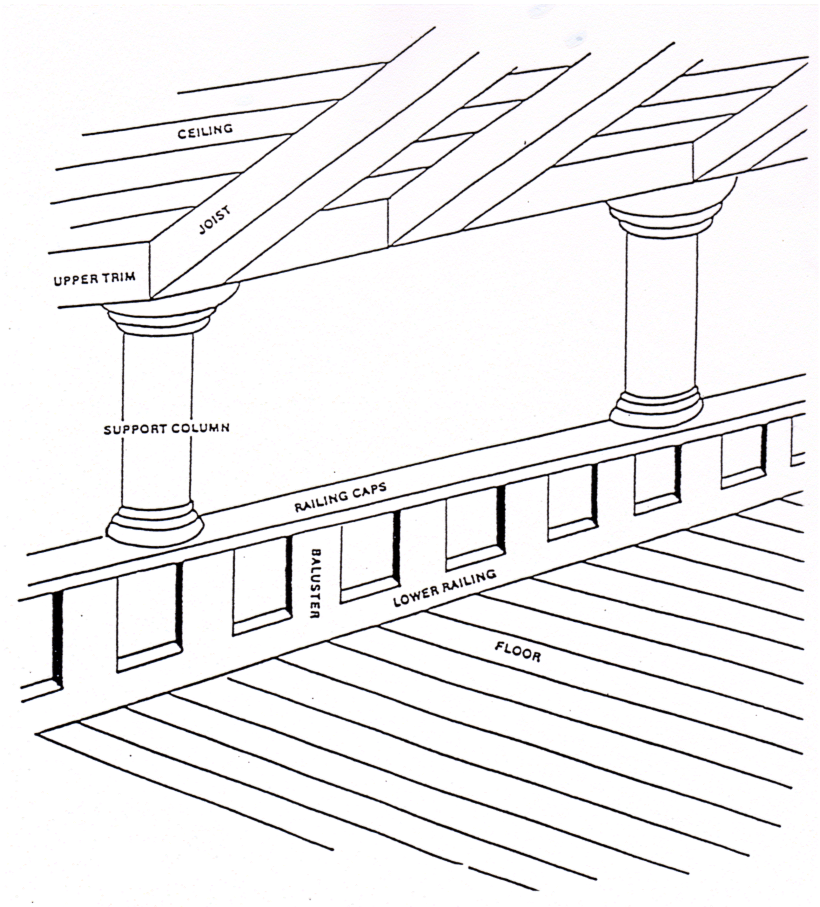


Diagram 7-C

L. Miscellaneous Exterior Items

Other items that may also be tested are:

- Fences, swing sets, laundry line post, storage sheds & garages, dog houses (if the pet comes into the house), fuel tanks, etc.

Why Sampling All Paint Layers is Necessary

Sampling all layers of paint is crucial. Several reasons to sample all layers include:

- No additional cost is incurred by sampling all layers, and if currently intact layers peel in the future, repeated sampling (with its additional expense) will not be required.
- The information helps the owner plan future activities even if the layers with lead are now intact.
- No available technology can clearly distinguish which layers contain lead and which do not.
- The presence of deteriorated paint is an indication that other layers are more likely to fail in the near future.
- Repairing deteriorated layers will usually involve some abrasion of the intact layers below, possibly resulting in a dust hazard.

Different methods of paint analysis will be consistent only if all layers are analyzed (e.g., XRF, which measures all layers of a surface, will produce different results from laboratory paint chip analysis if the latter includes only some of the layers).

PAINT CHIP COLLECTION

Prior to testing deteriorated surfaces by paint chip collection, it is prudent to collect the necessary dust wipes in the areas with deteriorated paint so that the risk assessor can avoid the possibility of further contamination of horizontal surfaces which will be sampled for leaded dust.

Paint Chip Sampling Supplies:

- ✓ heat gun with a setting below 1,100^{o} F.
- ✓ 3’ x 3’ piece of 6 mil poly sheeting
- ✓ Role of ¾ or 1 inch quick release masking tape
- ✓ 4 x 3 index cards or larger
- ✓ utility knife
- ✓ variety of 2” scrapers including one with replaceable blade
- ✓ pencil
- ✓ template with 2” x 2” square cut out of center
- ✓ hard shell containers such as plastic or glass vials for sample collection
- ✓ indelible marker for labeling vial
- ✓ box of wipes for cleaning scrapers, templates, hands as necessary
- ✓ thin powder-free gloves
- ✓ trash bags
- ✓ sample collection forms
- ✓ laboratory Chain of Custody forms
- ✓ gallon size plastic baggies
- ✓ clear quick dry spray sealant
- ✓ extension cord and Portable Ground Fault Circuit Interrupter
- ✓ pen
- ✓ field log notebook {all field sampling notes (including collection forms), diagrams, questionnaires, site information should be inserted into the logbook so that the logbook contains all notes, results, etc as one comprehensive file for all information concerning the site}
- ✓ canvas bag, box or other container for sampling supplies: “Sampling Kit”
- ✓ list of supplies which are included in the sampling bag

Paint Chip Sampling Protocol:

1) Draw a diagram of the dwelling, both interior and exterior
2) Choose the sample collection locations as described above
3) Place poly under the area to be sampled and secure it at corners with masking tape
4) Place template on wall and, using pencil, outline area of sample
5) Wipe template, and place back in collection bag
6) Place masking tape around the penciled sample area on all sides
7) Slightly bend an index card along the long edge and tape it directly under the taped area to serve as a "collection shelf" for any paint which falls during sampling
8) Label sample vial with date, unique sample number and sampler's initials, (time will be added later), and record in field log book
9) Plug in heat gun, choose scraper, put on gloves (Be careful not to touch any potentially contaminated surface after gloves are on hands)
10) Using heat gun and scraper, remove the paint from within the taped area only, taking care not to loose any of the sample (Note: If more than $1/16^{th}$ of the sample is lost, or more than $1/16^{th}$ extra is scraped, the sample area is invalid and a new area must be chosen for collection)
11) Carefully place all scraped paint into the sample vial. If the paint falls onto the card, carefully bend the card to contain the sample and remove the card so that the paint can be put into the vial. **ALL LAYERS OF PAINT MUST BE INCLUDED. BECAUSE THE SAMPLE WILL BE ANALYZED FOR MG/CM^2, SUBSTRATE IN THE SAMPLE WILL NOT BIAS SAMPLE RESULTS.**
12) Put time collected on vial and seal vial, place vial in labeled gallon baggie (all vials will go into this baggie)
13) Record time in logbook.
14) Remove tape from wall and wipe wall
15) Place wipe and tape into trash bag
16) Wipe tools, allow heat gun to cool, place tools and supplies(except poly) in collection bag
17) Spray sealant onto scraped area
18) Wipe poly, fold and place in sampling kit
19) Discard gloves, place in trash bag
20) Move to next sampling location and repeat
21) Record sample location and number on diagram
22) AFTER ALL DETERIORATED PAINT CHIPS ARE COLLECTED, fill out Chain of Custody sheet, taking care to specify area included in sample (2" x 2") and request results in mg/cm2
23) Remove all sampling trash from property

Note: If sample size cannot be 2" x 2", risk assessor may collect 1" x 4". Some samples may be able to analyze smaller samples as long as the exact area scraped is reported. Please check with the laboratory. However, the method includes collection of 4 square inches for best results.

XRF ANALYSIS

XRF ANALYSIS- refer to appendix for Virginia Department of Health XRF Regulatory Guide

The X-ray fluorescence (XRF) Lead-in-Paint analyzer is a portable, hand-held instrument that immediately measures the lead content of painted surfaces without removing or damaging the paint or substrate. Using the principle of XRF, some units can detect lead through as many as 25 layers of paint. To accomplish these results the instrument utilizes a gamma radiation source (or sources), usually Cobalt-57 or cadmium-109. The paint to be analyzed is exposed to gamma rays from the source in the XRF instrument and atoms of the lead in the paint are "excited," causing them to generate X-rays. The occurrences of these X-rays are detected and translated by the instrument electronics to indicate the concentration of lead in the paint. Lead concentration readings, in milligrams of lead per square centimeter of surface analyzed (mg/cm^2), appear in a few seconds on a digital display window.

XRF manufacturers offer one-day courses teaching the use, care and precautions to be taken for their specific instruments, including packaging and transportation requirements. Anyone who plans to use an XRF machine, even a rented or borrowed one, must attend the course offered for the machine involved. The Virginia Department of Health - Radiological Health Program (VDH-RHP) XRF Regulatory Guide relates this and other requirements, which all users of XRF instruments must meet prior to operating an XRF unit.

XRF Safety

XRF instruments are constructed in a manner which enhances the safety of their use of radiation sources. Manufacturers' instructions should be followed carefully to assure their safe use.

Radiation Safety

- The three main methods for controlling exposure to radiation are time, distance and shielding. Simply put; the time control means that the shorter the time of exposure to a radiation source, the smaller the dose of radiation received and therefore, the less chance of damage to human tissues. The distance factor considers that the more distance afforded between a radiation source and a person, the less intense the dose of radiation will be. Shielding is used between the radiation source and a person so that the energy from the source can either be absorbed by the shielding or deflected away from areas where it could be harmful. The XRF operator must always be conscious of, and use these exposure control mechanisms.
- Because of the characteristic surface penetration capability of the energy emitted from the radioactive material in the XRF instrument, the operator must be aware of any people who might be in rooms or areas adjoining the area of operations.
- A radiation beam is emitted from the XRF unit to accomplish the intended operation. The direction that the beam travels is dependent upon the type of instrument being used. The instrument operator must be conscious of this direction to assure the safety of people in areas adjoining the survey operation area. This and other safety considerations will be discussed in the required instrument manufacturer's training program.

- Because the radiation source emits radioactive energy all of the time (even when the instrument shutter is closed), if the operator needs to use both hands, the XRF unit should be placed onto the ground or another safe, flat surface. It should never be held under the arm, between the legs or otherwise against the body.

Proper Storage/Transportation

- Properly storing the XRF unit requires that it be kept in an unoccupied area, behind a locked door or in a labeled, anchored box with a padlocked lid. The XRF units generally have a factory supplied storage/carrying case. They should always be stored in this case.
- When transporting the instrument, the storage box must be kept locked at all times. If the vehicle has a trunk, it must be stored there. When using a station wagon or a panel or pickup truck, the box must be secured to prevent sliding around in the vehicle. In a pickup truck, it must also be secured to prevent unauthorized removal.
- Each XRF unit will have specific requirements for transportation across state lines and/or shipment by commercial carrier. The Department of Transportation for each state through which the instrument will be carried must be contacted and their requirements ascertained.

Radiation Safety Officer

- Any office in the commonwealth where the possession of an XRF instrument is licensed must designate a Radiation Safety Officer (RSO). The RSO will be responsible for:
  - ✓ maintaining provisions of the radmat license and assuring that the license is kept

up to date.

- ✓ assuring that the XRF instrument(s) is (are) properly stored and that it is used in accordance with license requirements and only by authorized, properly trained, personnel.
- ✓ assuring that records are intact and accessible for inspectors.

Performance Characteristics Sheets

Each XRF device has a HUD/EPA - issued (or equivalent) performance characteristics sheet (PCS). The device must be used in accordance with the manufacturer's instructions and the PCS for that instrument. The PCS will contain information concerning:

- Substrate correction requirements.
- Calibration check tolerances.
- Interpretation of readings (positive/negative/inconclusive)
- Instrument bias and precision data.
- Other operation guidance requirements of the instrument.

Substrate Corrections

- Some XRF instruments require correction of systematic bias in results (negative or positive) caused by interference from certain substrate materials.
- The PCS for the instrument used will describe any necessary substrate correction(s) and the calculation methods to be used.

Licensing and Regulations

- A Radioactive Materials (radmat) License must be obtained in order to possess an

XRF unit in the Commonwealth of Virginia. A radmat License Application may be obtained by contacting the Virginia Department of Health's Radiological Health Program, 109 Governor Street Richmond, VA 23219.

- All users of an XRF device (including the RSO) must be trained in the proper use of the instrument. They must all be listed as users on the radmat license.
- The VDH-RHP and the Virginia Department of Professional Occupational Regulation (VDPOR) require that all XRF users receive VDPOR certification as either a lead Inspector/Technician or Inspector/Risk Assessor in order to legally use these devices in the commonwealth. Documentation of authorized, certified user credentials is required to receive licensing to possess an XRF analyzer and may be audited by VDH-RHP at any time.

Calibrations

- Instrument Calibration must be accomplished before beginning each inspection. At least three calibration check readings should be made at this time.
- Re-calibration should be done according to the instrument PCS at such times as; before each time the instrument is powered off, each time it is turned back on, after each four hours of continuous inspection use, and when the inspection activity is completed for the day. Re-calibration is not necessary if the instrument enters an automatic "sleep" state for battery conservation.

Source Replacement

- Replacement of the radiation source in the XRF must be done on a frequency determined by the half-life of the source used in the individual instrument (about 12 to 15 months). The instrument

supplier will generally perform replacement. The XRF supplier will provide timetables and directions to be followed for source replacement for their instrument(s).

Documentation

- Each XRF survey report should contain the date of the survey, the address description, the name of the risk assessor and his/her license number. The instrument calibration(s) should be shown along with the survey results.
- Other record copies, which must be kept on file and available for inspection are:
  - The current radmat license.
  - All training records of XRF users.
  - All certifications of XRF users.
  - Records of semi-annual instrument leak tests.
  - Source replacement records.
  - XRF instrument utilization logs.

For each unit to be inspected, a diagram of the unit should be drawn noting windows, doors, and any other relevant information. Each room should be labeled and numbered. To best describe the location of the components tested, each wall should be labeled A, B, C, or D. Standing inside of the unit, wall A should be the wall that faces the street or front entrance of the unit; wall B is the wall to the right; facing the street or the main entrance of the unit, wall C is the wall behind you; and wall D is the wall to the left as illustrated in Diagram 1:

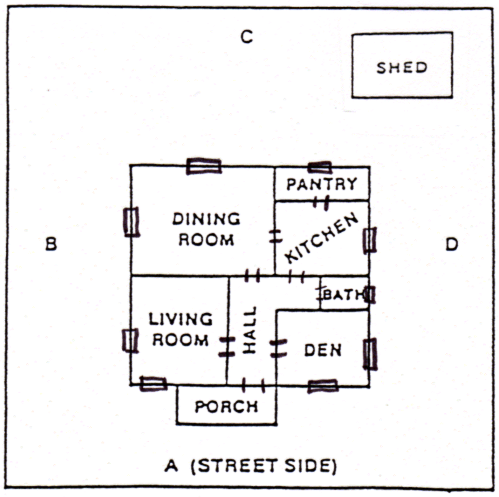


Diagram 1

Each XRF reading should have a room name & number; component name, substrate, and color; a wall location (e.g., center wall B); and paint condition. Noting this information will be beneficial when trying to re-identify what was tested. Some XRF software prints out a detailed report, which allows for this information to be entered. Documenting this information will assist the risk assessor in providing a hazard control plan.

DUST WIPE SAMPLING

The EPA has specific guidance for selecting media for collection of dust wipe samples. The wipe media must meet the performance requirements of ASTM-1792. The following list is published by the American Industrial Hygiene Association, which is one of the accreditation organizations used by NLLAP. The following list includes wipe media which allegedly meet the requirements of ASTM-1792 and is not meant to be all-inclusive.

- ✓ Palintest Dust Wipe available from Palintest located at 21 Kenton Lands Road, Erianger, KY, 41018, 800-835-9629.

- ✓ Lead Wipe (Aramsco) from Lynx Products, Thorofare, NJ, 800-767-6933.

- ✓ Wash 'n Dri Moist Disposable Towelettes from Softsoap Enterprises, Chaska, MN, 55318, 800-255-7552.

- ✓ Ghost Wipes from Environmental Express, 490 Wando Park Blvd, Mt. Pleasant, SC, 29464, 800-343-5319

Dust Wipe Sampling Supplies

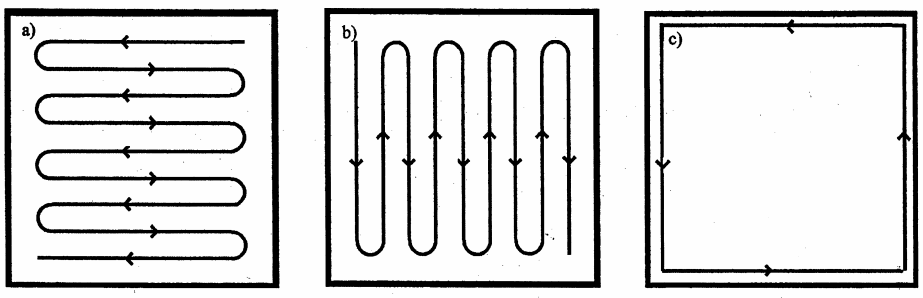
- ✓ 12" x 12" template
- ✓ ¾ " or 1" masking tape
- ✓ 2" masking tape
- ✓ 3' x 3' piece of 6 mil poly sheeting
- ✓ steel tape measure
- ✓ hard shell containers such as plastic or glass vials for sample collection
- ✓ indelible marker for labeling vial
- ✓ box of wipes for cleaning scrapers, templates, hands as necessary
- ✓ EPA approved wipe media for sample collection (store in zip loc bag to prevent contamination of outside of packaged wipe)
- ✓ thin powder-free gloves
- ✓ trash bags
- ✓ field log notebook
- ✓ sample collection forms
- ✓ laboratory Chain of Custody sheets
- ✓ gallon size plastic baggies
- ✓ pen
- ✓ field log notebook {all field sampling notes (including collection forms), diagrams, questionnaires, site information should be inserted into the logbook so that the logbook contains all notes, results, etc as one comprehensive file for all information concerning the site}
- ✓ canvas bag, box or other container for sampling supplies: "Sampling Kit"
- ✓ list of supplies which are included in the sampling bag

Dust Wipe Sampling Protocol: floors

1) Select floor area for dust wipe collection, taking care not to track across sampling area prior to collecting sample
2) Place sheet of poly next to sample area: this will serve at set up location
3) Place template on floor and secure at corners with making tape (If template is not available, using making tape and steel measuring tape, tape off a square which is 12" on the inside of the tape)
4) Label sample vial with date, unique sample number and sampler's initials, (time will be added later), and record in field log book
5) Put on gloves and open sample vial
6) Open the EPA approved wipe media (checking to make sure the wipe is still wet and not damaged in any way), place wipe on open flat hand with the fingers together and place wipe on floor inside template
7) Wipe the area from side to side with an S shaped pattern until the entire area is wiped one time
8) Fold the wipe in half with the wiped side to the inside of the fold
9) Place the wipe back onto the floor inside the template and wipe at a ninety degree angle in a second S shaped pattern
10) Fold the wipe in half again, folding the wiped side to the inside
11) Place wipe in one inside corner of the template and wipe inside edge of the template on all four sides
12) Fold the wipe in half with the wiped side to the inside and place in a sample vial, seal vial
13) Label the vial with the time.
14) Record the time on both sample vial and field log book
15) Place the vial in a labeled gallon baggie, seal baggie (all vials will go into this baggie)
16) Use the non-laboratory wipes to clean the template and wipe off the poly
17) Discard gloves, place in trash bag
18) Place all trash in trash bag, place all tools into sampling kit
19) Record sample location and number on diagram, move to next sample location
20) AFTER ALL DUST WIPES ARE COLLECTED, fill out Chain of Custody sheet, taking care to specify area included in wipe sample and remove all sampling trash from property

Dust Wipe Sampling Protocol: window sills

1) Select window sill for dust wipe collection
2) Place sheet of poly under the sample area: this will serve at set up location
3) Tape off all edges of the sill area to be wiped, taking care not to touch the inside sill area. (This aids the risk assessor in collection of the wipe by protecting from the possibility of over wiping the sill edges)
4) Label sample vial with date, unique sample number and sampler's initials, (time will be added later), and record in field log book
5) Put on gloves and open sample vial
6) Open the EPA approved wipe media (checking to make sure the wipe is still wet and not damaged in any way), place wipe on open flat hand with the fingers together and place wipe on sill inside template
7) Wipe the area from side to side with an S shaped pattern until the entire area is wiped one time
8) Fold the wipe in half with the wiped side to the inside of the fold
9) Place the wipe back onto the sill inside the template and wipe at a ninety degree angle in a second S shaped pattern
10) Fold the wipe in half again, folding the wiped side to the inside
11) Place wipe in one inside corner of the template and wipe inside edge of the taped window sill area on all four sides
12) Fold the wipe in half with the wiped side to the inside and place in a sample vial, seal vial
13) Label the vial with the time.
14) Measure to the nearest ¼" the area wiped inside the tape; record in field log book
15) Record the time on both sample vial and field log book
16) Place the vial in a labeled gallon baggie, seal baggie (all vials will go into this baggie)
17) Use the non-laboratory wipes to clean the poly
18) Discard gloves, place in trash bag
19) Place all trash in trash bag, place all tools into sampling kit
20) Record sample location and number on diagram, move to next sample location
21) AFTER ALL DUST WIPES ARE COLLECTED, fill out Chain of Custody sheet, taking care to specify area included in wipe sample and remove all sampling trash from property



FIELD BLANKS AND LABORATORY (MEDIA) BLANKS FOR DUST WIPES

Field Blanks are sample wipes that are exposed to the same handling except that they are not used to wipe an area. Field blanks should be collected at a minimum frequency of 5% or 1 for every 20 wipe samples collected, whichever is greater.

Dust Wipe Sample Field Blank Sampling Protocol:

1) While in the field sampling: Label sample vial with date, unique sample number and sampler's initials, (time will be added later), and record in field log book
2) Put on gloves and open sample vial
3) Open the EPA approved wipe media (checking to make sure the wipe is still wet and not damaged in any way), place wipe on open flat hand with the fingers together and place wipe on sill inside template
4) Fold sample in half three times, the same as if a sample was collected
5) Place the wipe in the vial
6) Enter time on vial and in logbook
7) When filling out Chain of Custody, do not reveal which samples are field blanks

Laboratory blanks are to ensure that the media is not contaminated with lead during manufacturing and packaging. No lab blank should contain lead $\geq$ 5 ug. For each lot of wipe media: take one laboratory blank in the following manner:

Laboratory (Media) Blank Protocol:

1) When a new lot of wipe media is received and while in the office: Label sample vial with date, unique sample number and sampler's initials, (time will be added later), and record in field log book
2) Put on gloves and open sample vial
3) Open the EPA approved wipe media (checking to make sure the wipe is still wet and not damaged in any way), place wipe on open flat hand with the fingers together and place wipe on sill inside template
4) Fold sample in half three times, the same as if a sample was collected

5) Place the wipe in the vial
6) Enter time on vial and in logbook
7) When filling out Chain of Custody, do not reveal which samples are laboratory or media blanks

SOIL SAMPLING

The elements of soil sampling are included below and are followed by a step by step procedure for collecting soil samples.

Soil Sampling Protocol

Compositing

In order to reduce variability, all soil samples collected for routine residential lead-based paint risk assessment and EIBL purposes are composite samples. This means that soil collected from more than one spot is mixed with soil collected from another nearby spot. Usually, one composite sample is collected from each of bare areas designated by the risk assessor as a child's play area(s) (if it can be identified) and a composite sample derived from the rest of the bare areas in the yard which are not designated as child play areas. Each composite sample usually consists of 5-10 subsamples mixed together.

Coring and Scooping Techniques

Soil samples are typically collected with a coring device, which works well for most soils. Some sandy or "friable" soils may require the use of a scooping device, such

as a stainless steel spoon or disposable plastic scoop. The risk assessor should collect soil no deeper than 1/2 inch.

Professional soil core sampling devices are available. These devices may be operated in either of two ways:

- by using a "T-handle" or other holding device; or
- by using a hammer attachment on top of the coring tool or probe (for hard or frozen soil).

The T-handle allows the operator to push the tool into the ground. The operator can use the T-handle to twist the coring tool as it is pushed into the ground, thereby allowing the cutting edge of the soil probe to cut through roots and packed earth. Although the T-handle is easiest to use, if the soil to be sampled is particularly hard and compacted, the operator may need to use a hammer attachment to collect the sample. To use the coring tool in this manner, the operator attaches the hammer device to the top of the coring tool and places the tip of the probe on the ground where the sample is to be collected. The operator then raises the hammer and allows it to fall while guiding it with the hands.

Another device that has been used successfully in soil sampling is a 5 cc disposable syringe with the needle end cut off. The plunger is used to remove the soil plug to avoid contact with the fingers. No cleaning is required, since the device is disposable. The syringe should be at least ½ inch in diameter. Syringes will not work well in hard or compacted soil.

To get a core sample, the operator inserts the selected tool at least ½ inch into the

soil, then moves the tool gently from side to side to loosen a plug of soil.* The operator then pulls the tool from the ground and uses a clean spatula or gloved finger to push the soil sample so that the upper part of the soil plug lies between ½ -inch marks made on the coring device. This ½ inch section of the soil core is transferred to a sample container. Only the top ½ inch of soil should be sent to the laboratory for lead-based paint risk assessment/EIBL purposes.

All subsamples are collected in this manner. The group of subsamples from the sampling grid or line is referred to as a "composite" sample, meaning that it is composed of the individual subsamples. After collecting a composite sample, the risk assessor should decontaminate the soil probe. (It does not need to be cleaned after each subsample is collected.) This process consists of wiping the end of the probe with wet wipes until all traces of visible dirt have been removed.

*****With many soil types, a coring depth of up to 2 inches may be required to retain the core in the sampling tool.

Soil Sampling Supplies:

- ✓ soil coring device, handle, and hammer attachment or equivalent (hammer is optional);
- ✓ stainless steel spatula or spoon (or disposable plastic);
- ✓ 5 cc disposable syringe with the needle end cut off
- ✓ ruler or tape measure;
- ✓ graph paper for soil plot sketches;
- ✓ nonpowdered, disposable gloves;
- ✓ sealable plastic containers or plastic bags;
- ✓ commercial disposable wipes;
- ✓ self-adhesive labels, pencil, and marking pen;
- ✓ sample collection forms
- ✓ Chain of Custody forms
- ✓ field log notebook {all field sampling notes (including collection forms), diagrams, questionnaires, site information should be inserted into the logbook so that the logbook contains all notes, results, etc as one comprehensive file for all information concerning the site}
- ✓ list of supplies which are included in the sampling bag

Depth

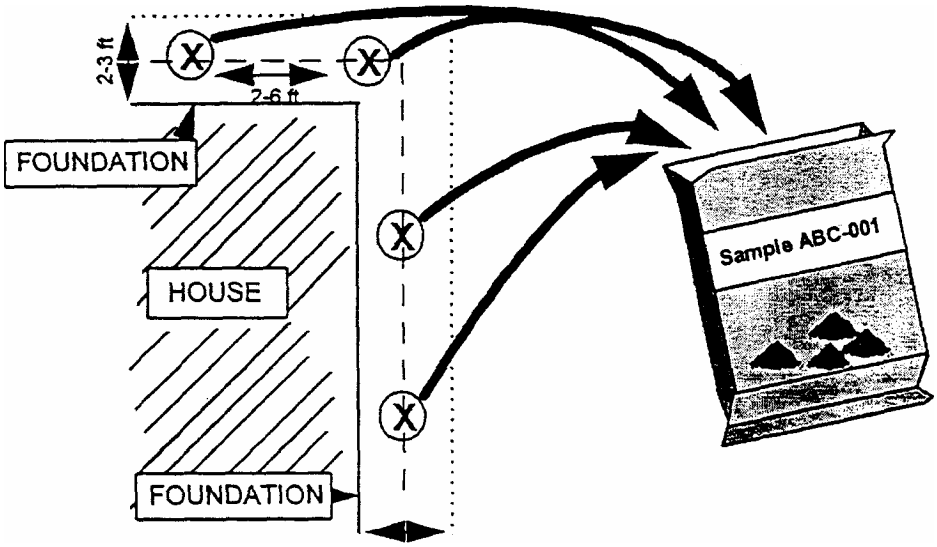
The depth of soil to be sampled is the top 1/2 inch (1 cm), because that is the surface a child contacts most frequently. Soil samples collected with this protocol have been correlated with children's blood-lead level in previous studies.

In some cases, sampling at deeper levels may be helpful if an owner is planning some form of excavation or tilling of a garden in the future or to determine the depth of contamination if soil abatement by removal and replacement is a recommended hazard control option. The individual needs of any specific owner should be evaluated to determine the type of information needed.

Number and Location of Soil Samples

Many different configurations of dwelling exteriors are likely to be encountered in the field. In most situations, several composite samples per dwelling will be adequate (one from each child play area, the other from the other bare soil areas). If the dripline is bare, this most likely will be identified as a play area due to the proximity to the dwelling. Each composite sample should consist of 5-10 subsamples (5 for smaller bare areas, 10 for larger), collected roughly along an X-axis.

Diagram for dripline sampling:



2-3 ft

For samples collected along the foundation dripline, subsamples should be collected at least two to six feet apart. Each subsample is then placed into a single container to make up a composite soil sample.

Sketches

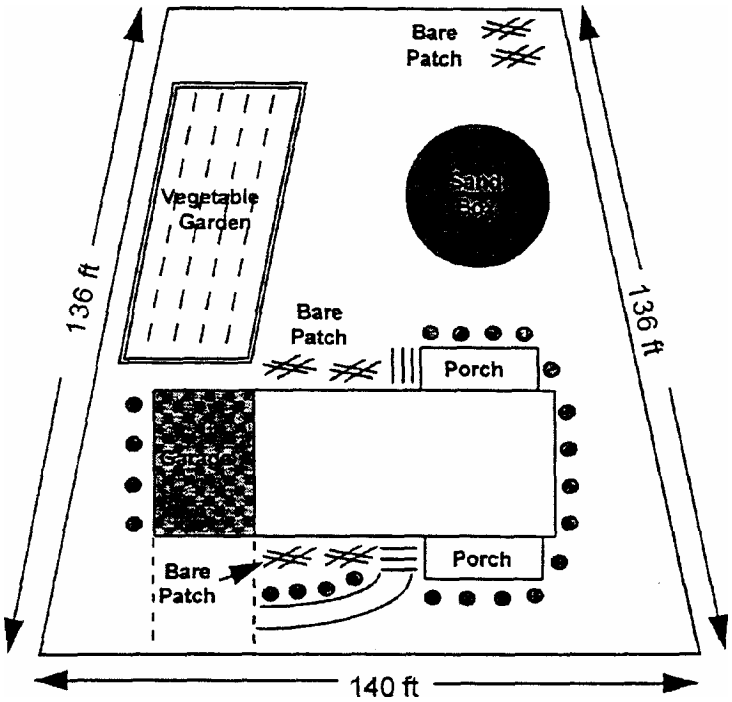
Begin by preparing a site description. Make a detailed drawing showing:

- ✓ the boundary of the lot;
- ✓ the position of the main building and any other structures such as garages and storage sheds;
- ✓ the position of the play areas;
- ✓ the position of areas with exposed soil;
- ✓ areas of heavier traffic.

Since only areas of bare soil are considered potential lead hazards under Title X*, the risk assessor should only sample areas of bare soil unless otherwise requested. Additional sites may be sampled if the ground cover on the sites may be disturbed in the future (e.g., gardening or excavation).

*Title X defines "lead-contaminated soil" as bare soil on residential property that contains lead at or in excess of the levels determined by the EPA to be hazardous to human health.

•80ft



Note: Not drawn to scale.
Example of site description showing lot boundary, building location, garage location, play area (sand box), and areas of bare soil, including vegetable garden

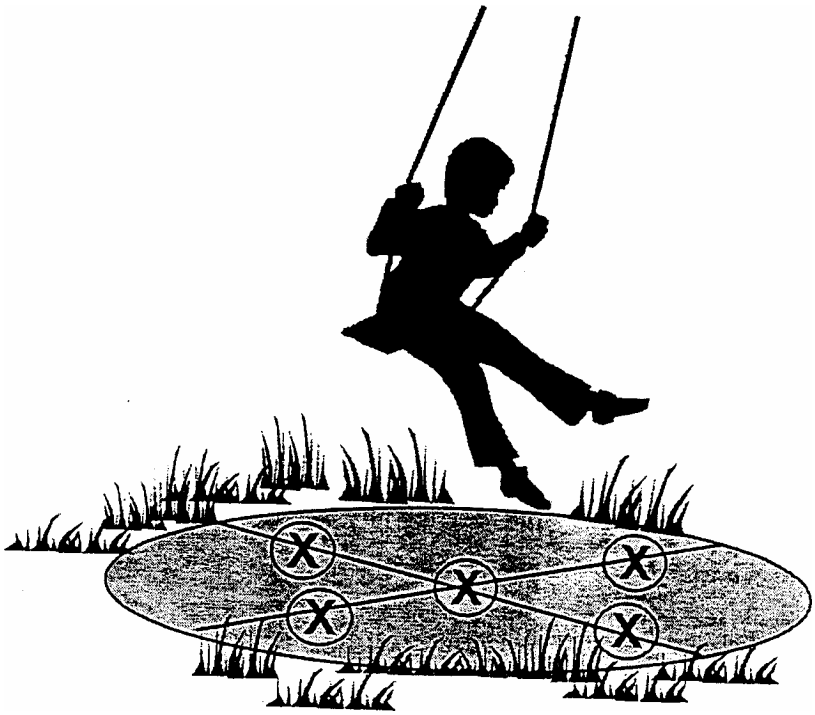
When Soil Sampling is Not Necessary

If there is no bare soil, sampling is not necessary. This includes areas where all soil is covered by pavement or a good dense cover of grass, ivy, or similar material. However, in most cases, there will be at least small bare areas that should be sampled**.**

Location of Subsamples

Each composite sample should consist of approximately equal soil subsamples collected from 5-10 distinct locations roughly equidistant from each other along an axis. For samples collected along the foundation drip line, subsamples should be collected roughly 2-6 feet away from each other. At other sampling locations, samples should be collected at roughly equidistant points along each axis of an X-shaped grid. Samples

should be collected from bare spots.



Areas of bare soil should be divided by an x-shaped grid. Subsamples should then be collected at equidistant points along each axis.

Paint Chips in Soil

If paint chips are present in the soil, they should be included as part of the soil sample. However, there should be no special attempt to over-sample paint chips. The laboratory should be instructed to disaggregate (break up) paint chips by forcing them through a sieve in the laboratory. Although paint chips should not be oversampled, they also should not be excluded from the soil sample, since they are part of the soil matrix.

Analysis of Soil Samples Results

As with dust samples, only laboratories recognized under the EPA National Lead Laboratory Accreditation Program should be used by risk assessors.

Soil Sampling Protocol

1) Walk the entire property, draw a diagram the property and locate all bare areas on the diagram
2) Based on information supplied by resident and on risk assessor's observations, determine which areas are child play areas and which are non-play areas
3) Each play area will be sampled with a composite sample
4) All other bare areas will be composited together into one composite area (subject to risk assessor's judgement)
5) Superimpose an "X" over each child play area
6) Put on powder free gloves
7) Dependent upon size, collect 5-10 subsamples along the "X" of the top ½ of soil for the first child play area, using one of the collection devices described above
8) Place all subsamples in one sample container (heavy duty Ziploc baggie or hard shelled sealable container)
9) Mix subsamples to ensure homogeneity
10) Label sample container with date, initials of sampler, time and unique sample number
11) Record information in field log book (including description of area and sample location), and locate sample number on diagram
12) Clean sampling equipment with lead free commercial wipe
13) Discard gloves
14) Repeat steps 6-13 for each child play area
15) Superimpose an "X" over each bare area designated as a non-play area
16) Collect between 5-10 total subsamples from all non-play bare areas
17) Mix subsamples to ensure homogeneity
18) Label sample container with date, initials of sampler, time and unique sample number
19) Record information in field log book (including description of area and sample location), and locate sample number on diagram
20) Clean sampling equipment with lead free commercial wipe
21) Discard gloves
22) After all soil samples are collected, fill out Chain of Custody sheet, and remove all sampling trash from property
23) Place trash in trash bag and remove all sampling trash from property

Blank and Control Samples

No blank or field "spike" (control) soil samples are required for routine lead-based paint risk assessments.

WATER SAMPLING

Sampling Technique for Lead in Drinking Water

Because the most likely sources of lead in drinking water are internal to the dwelling, lead tends to build up in water stagnant in the pipes overnight. Therefore, the highest levels of lead in tap water are usually encountered in the first water from the tap in the morning, the so-called "morning first draw." The sampling strategy outlined below is designed to differentiate between different sources of lead in tap water, and, therefore, to suggest effective ways to deal with the problem if it is present in a dwelling.

Water Sampling Supplies:

- ✓ 2 – 250 cc acidified containers from lab (nitric acid)
- ✓ 750 cc acidified containers from lab
- ✓ one liter acidified container from lab
- ✓ sample labels
- ✓ gloves
- ✓ indelible marker
- ✓ pen
- ✓ field log notebook
- ✓ chain of custody forms
- ✓ sign for kitchen tap
- ✓ field log notebook {all field sampling notes (including collection forms), diagrams, questionnaires, site information should be inserted into the logbook so that the logbook contains all notes, results, etc as one comprehensive file for all information concerning the site}
- ✓ list of supplies which are included in the sampling bag

Water Sampling Protocol:

1) Contact laboratory to obtain sample containers. (The best sampling collection and preservation method is to sample into acidified containers).
2) Arrange sampling date with residents. Explain the "8 hour undisturbed water period" to them and work out the best time frame for collecting the first draw.
3) Deliver a sign to the residents to place on the kitchen tap at night to remind them not to use the tap until sampling is completed.
4) Arrive at residence at agreed upon time and date.
5) Label each sample container (date, sampler's initials, and unique number) and fill field log book with all field information. NEVER OVERFLOW BOTTLES BECAUSE THE ACID PRESERVATION WILL BE DILUTED.

6) FIRST SAMPLE: Take 250 cc (about 1/2 pint) of water from the cold water kitchen tap after there has been no water usage for at least 6, preferably 8 hours (morning first draw). Put time on sample label and in log book.

7) SECOND SAMPLE: Take 750 cc (about 1 and 1/2 pints) immediately after the first sample. and without wasting any water in between. Put time on sample label and in log book.

8) THIRD SAMPLE: Take 250 cc after the water turns cold or any other indication that the water is representative of service line (let water run approximately 3-5 minutes). Put time on sample label and in log book.

9) FOURTH SAMPLE: Take 1000 cc (1 liter)after the water has run for about 3-5 additional minutes after the third sample, or has otherwise been determined to be representative of water from the supply source (e.g.. has reached a constant temperature). Put time on sample label and in log book.

Samples are typically collected in clean, plastic (Nalgene) bottles. If the samples are not analyzed within 28 hours, some of the lead in the water may be transferred to the container walls. This may be avoided by the use of laboratory acidified containers. Laboratory analysis often consists of AAS or ICP analysis. In some cases, sample digestion may be required. A risk assessor should always contact the laboratory before water samples are collected to ensure that the sample is collected and analyzed properly. Laboratory results are usually reported in units of parts lead per billion parts water (ppb).

The simple testing program outlined above is adequate to determine the status of lead in the tap water in a single family home. In a multi-unit project, the situation is more complicated, because the plumbing system is larger and more complicated, and because there may be additional sources of drinking water such as water coolers. Nevertheless, the simple test procedure for a single-family home can still give the residents of particular unit important information. Also, the same principle of successive testing to isolate sources of lead in the water can be applied to design effective customized sampling procedures even for very large buildings.

Questions about the proper procedures to follow for testing for lead in drinking water can be directed to the Safe Drinking Water Hotline at 1-800-426-4791. The information specialists at this number can provide callers with telephone numbers of individuals to contact in their own states. Some state offices also can provide callers with information on laboratories certified to test for lead in drinking water in that state.

Interpretation of Results

- According to HUD Guidelines and EPA standards, lead dust results that equal or exceed the following levels can be considered possible sources of lead exposure:
    - Floors 40 $\mu g/ft^2$
    - Window sills 250 $\mu g/ft^2$
    - Window wells 400 $\mu g/ft^2$

- According to HUD Guidelines and EPA standards, paint is considered to be lead-based if the level is equal to or greater than 0.5% by weight or 1.0 mg/cm² (although both HUD and the EPA prefer concentration to be reported in mg/cm². If the paint is lead based paint and is also deteriorated, the surface is a paint lead hazard.
- Soil Lead Hazard is defined as bare soil on residential properties that contain lead greater than or equal to 400 ppm in child play areas and an average greater than or equal to 1200 ppm in other bare soil areas.
- The USEPA has recently established (May, 1991) a new National Primary Drinking Water Regulation for lead, with a Maximum Contaminate Level (MCL) of 15 ppb for water in dwellings. EPA research revealed a direct correlation between elevations in children's' blood lead levels and concentrations of 15 ppb or higher in their primary water source. The test results should be interpreted in terms of this MCL. In most circumstances, the four samples recommended will show decreasing levels of lead: the first sample will have the highest level: the fourth will have the lowest. Perhaps the most common situation of concern will be when the first and second samples exceed the action level, but the third sample is much lower. This indicates that the water is contaminated with lead from the plumbing internal to the dwelling, from lead present in the pipes or connections, combined with acidity of the water itself. The residents can take several simple steps to protect themselves in this case. First, when using water after a period of inactivity, such as first thing in the morning, let the water run for 60 seconds to 2 minutes to reduce the lead levels. Second, because warm water is more corrosive,

always use water from the cold tap for cooking. Third, never use the first draw or warm water when making baby formula. If there is concern about letting water run from the tap before using it to drink or cook with, it is suggested that this water be used to water plants that are not eaten or for other activities which do not involve ingesting the water. When the third sample shows elevated lead levels, the problem is traceable to the service line from the water supply. In such cases, even though the residents may own all or part of their service line, the water company should be contacted to discuss service line replacement. EPA's National Primary Drinking Water regulations for lead, referred to above, mandate a program of replacement of lead service lines over time under certain conditions. Unfortunately, such replacement may take many years. Use of bottled water for drinking and cooking or filtering techniques, if feasible, and is a possible practical solution to such a problem. In the unlikely event that the fourth sample shows lead above the action level, the source is the water supply itself. Again, the residents should contact the water company

ADDITIONAL SAMPLE COLLECTION:

As previously stated, there may be unusual sources of lead in a lead poisoned child's environment and all potential sources must be considered. Based on questionnaire results and professional judgement of the risk assessor, here are some potential sources:

- Hobbies such as homemade ceramics, artists, jewelry making, stained glass art, packing or handling ammunition, handling or making fishing sinkers, collecting

antique dolls, toys soldiers, old trains or cars, or Spanish/Mexican/Portuguese/Italian glazed pottery

- Occupational exposures brought home on clothing and/or equipment: battery recycling or manufacturing, renovator, demolition worker, cable splicers, auto body repair, incinerator attendants, firing range operators or users, ship yard activities, smelting workers, plumbers, foundry workers, painters, chemical plant workers, oil refinery work, and others
- Folk or home remedies
- Window glazes or putty used in wooden floor cracks
- Print from newspapers, magazines
- Matches
- 1 inch vinyl mini blinds
- Plastic jewelry
- Candle wicks
- Key rings

These and other potential lead containing items are discussed on the following pages.

HOUSEHOLD ITEMS WHICH MAY BE LEAD HAZARDS

There are many items that we use or come in contact with everyday that probably contain higher levels of lead than you would expect or could imagine. Listed below are some of the various household items that may contain enough lead to be considered hazardous to one's health.

Antique toys/furniture

Some antique toys/furniture may contain lead, such as pewter or brass. Be cautious of children putting these items into their mouths.

Bathtubs

Potential lead exposure by older bathtubs that are coated with lead based paint can be sealed with an encapsulant to prevent lead leaching.

Batteries

Lead-acid batteries used in vehicles and household products are safe when sealed, but can leak dangerous lead and acid if mishandled. Wash hands carefully after handling them.

Calcium Supplements (oyster shell)

Read the label and check for the amount of lead in each calcium tablet. The federal suggested maximum exposure to lead without a required warning is 0.5 micrograms per day.

Ceramics

Ceramics from other countries, and those made by U.S. craftspeople, are more likely to pose a risk. Do not store food in any dishes, antiques, or collectibles that may contain lead nor use of lead-glazed mugs or cups for hot beverages.

Colored Newspaper and Printed Bags

Do not burn color printed paper in fireplaces or stoves. Wash hands after touching comics or comic books (colored newsprint), and do not let infants or children chew on colored newsprint.

Cosmetics

Cosmetic products made in foreign countries may have a high lead content. (e.g., some

eye shadows made in India, Middle East and some parts of Africa). Always read the list of ingredients on the label when choosing cosmetic products. Some substances to look for are surma or kohl (alkohl).

Crayons

Some crayons imported from China were found to contain lead. The lead content is enough to present hazard to young children who might eat or chew on the crayons. The crayons were sold by Concord Enterprises, Toys R Us, and Glory Station Manufacturing Co. Ltd. and pulled from the shelves in 1994.

Curtain Weights

Weights contain lead which may be ingested.

Faucets

Some older faucets are considered a source of lead because they are made of brass. Lead in the faucet can easily be removed and replaced with copper by running a solution of oxidized copper through the faucet.

Fertilizers

Fertilizers can be another potential pathway to human lead exposure. Fertilizer manufactures have discovered that nutrients such as zinc, magnesium, and nitrogen are abundant in chimney ash and waste from industrial processes like smelting, aluminum production, cement kilns, and even paper mills. In many cases fertilizer manufactures have brought truckloads of these waste products and mixed them in batches of fertilizer. The problem arises when the wastes are loaded with lead. Zinc and lead tend to occur together in ores, and zinc smelting byproducts tend to be rich in lead.

Folk Remedies

Folk medicines and/or foreign-made medicines are sometimes used to treat a variety of health problems, most commonly digestive ones. Many of these substances contain lead. In Mexico, remedies known as azarcon, greta, and albayalde, which are powdery substances, often yellow or red, are made up primarily of lead compounds. In the Mediterranean basin and in Southeast Asia, a substance called paylooah is used to treat fever and rash. These also contain a significant amount of lead.

Food

Be aware that when buying imported canned food, lead is still used to seal some imported cans. Do not store food in any opened cans, U.S. or imported. Also foods prepared in a lead soldered kettle may be a source of exposure.

Food Wrappers

Some food packaging materials, such as bags, may have ink that contains lead on them. Do not reuse food packaging materials with ink on them.

Glass or Crystal Ware

When using lead crystal items, one should NOT: a) store liquids in lead crystal glasses or bottles, b) drink from lead crystal on a daily basis, especially if pregnant, or c) feed an infant or child from a lead crystal baby bottle or cup.

Hair Dyes

Dyes formulated with lead acetate are potentially hazardous. Alternative hair coloring products may be safer because they contain organic dyes and bleaches that cause

immediate changes in color and require neither daily nor weekly application.

Key Chains

There have been some reports of children being lead poisoned through ingestion of leaded dust from key rings and key chain emblems.

Lead Pipes and Solder

Soft acidic water is a high risk for leaching of lead from lead pipes or soldering. Run water for 60 seconds to 2 minutes before using; and when cooking, use cold tap water, never hot water.

Plastic Mini-blinds

Lead has been added to some non-glossy vinyl miniblinds for stabilization--especially those blinds from China, Taiwan, Indonesia and Mexico. Purchase vinyl miniblinds packaged in cartons indicating absence of lead (e.g., "new formulation," "non-leaded formula," "no lead added," or "new! non-leaded vinyl formulation").

Pool Cue Chalk

Some pool chalk contains lead.

HOBBIES THAT CAN CAUSE LEAD EXPOSURE

Hobbies which can result in lead exposures are often overlooked Individuals may spend most of their leisure time working on hobbies, the exposures to the individual can be significant and can generate lead hazards for family members and occupant of the residence.

Ceramics

Some glazes used by hobbyists in the creation of glazed pottery may contain lead and the fumes can expose the hobbyist and other members of the family to lead vapors when the glaze is heated to high temperatures.

Cooking

Cooking in imported glazed cookware can expose families to ingestion of excessive levels of lead in their food.

Drawing

Some coloring pencils and crayons imported from other countries may contain excessive levels of lead and pose a danger when ingested by children.

Fishing

Melting lead for fishing sinkers can expose hobbyists and their families to excessive lead exposure from inhaling fumes.

Jewelry-making

Jewelry makers using brass are at risk of lead poisoning, unless lead-free brass and adequate ventilation are used. Street vendors who assemble bracelets and other jewelry at home may be exposing their children to a heightened risk of lead poisoning by leaving lead components unattended.

Painting and Printmaking

Printmakers and painters who use oil-based paints were found to have the highest risk of all artists.

Shooting/Reloading Ammunition

Target shooting at firing ranges can pose a threat of excessive exposure to lead dust for

the shooter, unless adequate ventilation and other safety precautions are made available.

Soldering

Soldering is used to join metal objects for a variety of hobbies and crafts. Lead solder ingested in minute quantities is suspected of causing cancer of the mouth, throat, or stomach. Soldering heats the leaded object (and the solder) to a temperature high enough to produce lead fumes. Lead fumes are very small particles of lead, too small for the eye to see, which are then deposited onto surrounding surfaces, thus becoming a lead hazard.

Stained Glass

Solder used in the manufacture of stained glass windows and lamps is often made of lead and can pose a health hazard when heated to high temperatures. The use of lead-free solder and adequate ventilation and safety precautions are recommended.

OCCUPATIONAL SOURCES

- ammunition manufacture
- auto mechanics
- battery manufacture
- ceramic glaze mixing
- bridge work or highway maintenance
- factory workers (pewter or crystal)
- foundries (brass, copper, or lead)
- plumbing
- radiator repair
- renovation/demolition

- sandblasting
- scrap handling
- shipyard
- welding/smelting

Also of interest are items that have been recalled for lead content by the Consumer Product Safety Commission. You can find this information on their website at www.cpsc.gov.

Reporting: The EIBL Investigation Report

After the completion of the EIBL investigation, the report should be prepared to include a summary, applicable XRF data, environmental and other type of sample results and information, recommendations for the residence, abatement and interim control hazard options, and a reevaluation schedule. (See appendix for an example of an EIBL investigation report) It is also imperative that a disclosure statement be included on the report. Copies of the report should be distributed to the owner, nursing staff/physician, and the locality's code enforcement authority.

EIBL Investigation Report

The report should include the following information:

- date of assessment
- address of each building
- date of construction of buildings
- apartment number if applicable

- name, address and telephone number of each owner of each building
- name, signature and license number of the risk assessor conducting the assessment
- name, address and telephone number of the licensed firm employing each licensed risk assessor if applicable
- name, address and telephone number of each recognized laboratory conducting analysis of collected samples
- results of the visual inspection
- testing method and sampling procedure for paint analysis
- specific locations of each painted component tested for the presence of lead
- all data collected from on-site testing, including quality control data and, if used, the serial number of any XRF device
- all results of laboratory analysis on collected paint, soil and dust samples
- any other sampling results
- all field sampling paperwork (as an appendix)
- all completed data forms as included herein
- any background information collected regarding the physical characteristics of the residential dwelling or child-occupied facility and occupant use patterns that may cause lead-based paint exposure to one or more children age 6 years and under.
- To the extent that they are used as part of the lead-based paint hazard determination, the results of any previous inspections or analyses for the presence of lead-based paint, or other assessments of lead-based paint-related hazards.
- A description of the location, type and severity of identified LBP hazards and any other potential lead hazards

- A description of interim controls and/or abatement options for each identified lead-based paint hazard and a suggested prioritization for addressing each hazard. If the use of an encapsulant or enclosure is recommended, the report shall recommend a maintenance schedule for the encapsulant or enclosure
- Any applicable comments on local funding for abatement.

Enforcement

The enforcement of lead based paint hazard controls is turned over to the Department of Inspections or locality's code enforcement agency. This is the reason why a copy of every risk assessment report should be given to the local building code official. Experience has shown that enforcement of lead-based paint hazard remediation can best be accomplished by a team approach, between the environmental health staff in the local health department and the code enforcement in the local jurisdiction. Attempts to "refer the problem over" to one or the other agency usually do not result in satisfactory remediation.

When lead based paint violations are referred to a building official's office for enforcement under **The Virginia Uniform Statewide Building Code**, enforcement often fails due to insufficient health expertise. When building officials leave these violations to the health department, enforcement often fails due to insufficient regulatory authority and the lack of the administrative structure necessary for building code enforcement. Effective enforcement therefore requires the cooperation of both the health department and the local building official's office.

The Virginia Uniform Statewide Building Code (USBC) is a state regulation promulgated by the Virginia Board of Housing and Community Development, which sets standards for the construction of buildings. Construction includes reconstruction, alteration, repair, and conversion of buildings. The USBC requires buildings to be properly maintained and in some instances requires existing buildings to be upgraded or "retrofitted" to become safer than when they were initially constructed. Provisions requiring the removal or covering of lead-based paint in dwellings and child and day care facilities, including fences and outbuildings, when such paint contains lead levels equal to or greater than 1.0 milligram per square centimeter or in excess of 0.5 percent lead by weight have been in place in the USBC since the early 1990's. The current USBC lead provisions do not require removal and covering of the lead-based paint unless surfaces are not maintained in a condition free from peeling, chipping, or flaking paint. Enforcement of the provisions of the USBC for the maintenance of existing buildings is by the local governing body of any city, town, or county. The enforcement is optional and any agency so designated by the local government may act as the enforcing agency, as opposed to the enforcement of the new construction standards of the USBC, which the local government must enforce through a department of building inspection. Violators of the USBC may be criminally prosecuted, and these violations are misdemeanors; however, local governments may enact an ordinance to provide for civil penalties for USBC violations in lieu of criminal sanctions.

FAMILY/OCCUPANT HAZARD CONTROL

There is often a long period of time from notification of a child with an elevated blood lead level to the identification of financial resources to make a residence lead-safe or to relocation of the family to other lead-safe housing. Therefore, it is imperative that owner/occupant and tenant families are given information about sources and routes of exposure to protect their children from lead hazards.

There are three excellent pamphlets produced by the Environmental Protection Agency offer very valuable information for parents and owners about ways to protect families from lead exposure.

- Protect Your Family From Lead In Your Home
- Reducing Lead Hazards When Remodeling Your Home
- Lead In Your Home: A Parent's Reference Guide

Licensed Contractors

The Virginia DPOR Lead regulations have specific requirements which apply to lead activities in residences. The requirements for licensing and lead-based paint activities may be found at:

http://www.state.va.us/dpor/led_reg_2004.pdf

These regulations state "This chapter is applicable to all individuals and firms who are engaged in lead-based paint activities as defined in 18 VAC 15-30-20, except persons who perform these activities within residences which they own, unless the residence is occupied by a person or persons other than the owner or the owner's immediate family

while these activities are being conducted or a child residing in the building has been identified as having an elevated blood-lead level". According to these regulations, an owner cannot perform lead activities on the premises if a lead-poisoned child resides in the residence. Per the intent of an EIBL investigation, the lead hazards must be identified and controlled. With this stated purpose, all activities in residences where lead-poisoned children reside must be conducted by licensed abatement contractors.

These requirements are based on research evidence which revealed that renovations that disturb lead-based paint and disperse lead dust throughout a home can make the home unsafe for occupancy. Failure to contain lead dust and paint chips and to clean properly makes small children especially vulnerable to lead poisoning. The Virginia Department of Professional and Occupational Regulation issues licenses to contractors and inspectors who meet the requirements and maintains a list of licensed lead abatement professionals in the Commonwealth of Virginia.

Workers conducting lead based paint activities are also at risk for lead poisoning if lead safe work practices are not followed. **The Department of Labor and Industry (DOLI)** is the state agency responsible for enforcement of worker safety requirements under the **Lead in Construction Standard** developed by **OSHA. DOLI regulations** require that all lead hazard reduction activities which cost $2,000.00, or more, and are performed by a contractor, be reported to the **Department of Labor and Industry.**

Hazard Control Options

Question: **What criteria should guide an owner or property manager in the selection of the use of abatement or interim controls in the design of a lead hazard reduction strategy?**

Answer: **Determine if the hazards identified are potential or immediate hazards.**

Lead-based paint hazards are classified as potential or immediate hazards. Any friction, impact, or accessible, chewable surface component with LBP is considered a potential hazard. If the paint is in intact, potential hazards can be managed in-place and monitored for integrity. If at any time the paint integrity becomes disturbed, it is then considered an immediate hazard. Immediate hazards are those six high hazard situations believed to produce lead exposures that poison children. They include:

1. **Deteriorated LBP** whether it is interior or exterior that is peeling, chipping, chalking or cracking, or located on any surface that is damaged or deteriorated.
2. Deteriorate LBP on any interior or exterior **"friction surface"** subject to abrasion or friction, such as painted floors and friction surfaces on windows.
3. Deteriorated LBP on any interior or exterior **"impact surface"** subject to damage by repeated impacts, such as parts of door frames.
4. Deteriorated LBP on any interior or exterior **"accessible chewable surface"** accessible for a young child to mouth or chew, such as a windowsill.
5. **"Dust Lead Hazard"** is defined as surface dust in residential dwellings that

contain an area or mass concentration of lead in excess of 40 $\mu g/ft^2$ for floors, 250 $\mu g/ft^2$ for window sills, and 400 $\mu g/ft^2$ for window wells.

6. **"Soil Lead Hazard"** According to the EPA 403 rule**:** A soil-lead hazard is present:

   In a play area when the soil-lead concentration from a composite play area sample of bare soil is equal to or greater than 400 parts per million; or
   In the rest of the yard when the arithmetic mean lead concentration from a composite sample (or arithmetic mean of composite samples) of bare soil from the rest of the yard (i.e., non-play areas) for each residential building on a property is equal to or greater than 1,200 parts per million.

Hazard Control Options: Abatement

Abatement is a measure or measures designed to permanently eliminate lead-based paint hazards. From a public health perspective, properly conducted abatement is the desired response to lead hazards. Abatement has two principal advantages: (1) it provides a long-term solution, and (2) little (if any) monitoring or reevaluation of the treated surfaces is necessary since failure is less likely to occur. LBP abatement refers to a group of measures that can be expected to eliminate or reduce exposures to lead hazards for at least 20 years under normal conditions since 20 years is the expected life span of many commonly used building components. Abatement is the closest one can get to a "permanent solution" to lead hazards in housing.

Abatement measures include:

- building component replacement;
- enclosure systems;
- paint removal (on-site or off-site);
- encapsulation (with patch test and a 20 year warranty);
- permanent soil covering (paving); and
- soil removal and replacement.

Building Component Replacement

Building component replacement consists of removal of doors, windows, trim and other building items that are coated with lead-based paint and their replacement with new lead-free components. This measure is appropriate when the component is mostly deteriorated, since interim control measures are unlikely to be effective on unsound components (rotted windows sashes, door, etc.). The advantages of building component replacement are that it creates a permanent solution by removing all lead-based paint; it minimizes dust contamination to the property; and it minimizes worker and resident exposure. The disadvantage is it can be relatively expensive; in some historic preservation projects, component replacement may not be permitted; and when trim removal reveals an opening, large amounts of dust can be released.

Enclosure Systems

Enclosure systems consist of mechanically attaching a rigid, durable barrier to building components, with all edges and seams sealed with caulk or other sealant.

Enclosures are intended to prevent access and exposure to lead-based painted surfaces and provide a "dust-tight" system to trap any lead-contaminated dust. Some appropriate materials for enclosure are:

Interior finish	-	drywall, paneling, wainscot
Exterior finish	-	aluminum, vinyl siding
Exterior trim	-	aluminum or vinyl coil stick
Steps	-	vinyl or rubber tread and riser coverings
Floors	-	underlayment and vinyl or other sheet finish goods

The advantages of enclosure are it allows the use of standard, locally available construction materials; it is highly reliable and may be more durable than encapsulation; it produces minimal waste, and it generates minimal levels of lead dust. There are several disadvantages of enclosure. It does not permanently remove lead-based paint (it only makes the dwelling free of hazards). The systems are vulnerable to water and physical damage. Future renovations can result in exposure to surfaces and create hazards (note: it is important to label surfaces that have lead-based paint before they are enclosed.). It cannot be used on unsound structures. Enclosures should be monitored annually by the owner. And aluminum or vinyl exterior siding can conceal rotting wood.

On-Site Paint Removal

On-site paint removal consists of an on-site separation of paint from the substrate using a variety of methods. Appropriate methods include heat guns operated at

temperatures not greater than 1,100 digress Fahrenheit, chemical removal, and mechanical (HEPA sanding, wet scraping, HEPA vacuum blasting, HEPA vacuum needle blasting). The advantage of on-site paint removal is it can be less costly than replacing or enclosing building components. The disadvantage of on-site paint removal is a significant amount of dust may be released; caustic chemicals are used; chemical stripping can leave lead residues; certain mechanical methods are not effective on certain substrates; and specialized equipment is needed.

Off-Site Paint Removal

Off-site paint removal consists or removing paint through chemical or other means at a facility not on the abatement site (chemical stripping/dipping operations). The advantage of using off-site paint removal is that it has a low reevaluation failure rate; it is appropriate for historic preservation; minimal waste is generated on-site; and minimal ongoing monitoring is needed. The disadvantages of using off-site paint removal is that it can be expensive; it may deteriorate glues or other elements of components which may cause components to disintegrate; and it does not remove lead from the wood, which may release lead dust if it is disturbed again.

Encapsulation

Encapsulation is the process of rendering lead-based paint inaccessible by providing a barrier between the paint and the environment. The barrier is formed using a liquid-applied coating (with or without reinforcement materials) and/or an adhesively bonded covering material. Generally, encapsulants are attached to the surface by bonding

the product directly to the surface or by using an adhesive. The HUD guidelines require that the manufacture provide a 20-year warranty on the effectiveness of the product. The HUD guidelines also require that the property owner must conduct visual monitoring at one and six months after application to be sure the encapsulant is still intact. The advantages of encapsulation are that lead dust is not generated (if surface preparation is minimal); it may be less costly compared to other abatement methods; and a wide range of encapsulation products are available to meet different needs. The disadvantages of encapsulation is that it is inappropriate for use on friction, impact, chewable, or severely deteriorated surfaces; information on long term durability is limited; durability depends on the condition of previous paint layers; it is susceptible to water damage; and it may not be applied in extremely hot or cold weather conditions.

Permanent Soil Covering

Permanent soil covering consists of permanently covering bare, lead contaminated soil with concrete, asphalt, or other permanent materials. The advantage of permanent covering is that it is a permanent solution, provided that the source of lead in the soil has also been controlled; and it is less costly than removal and replacement of soil. The disadvantage of permanent covering is that it is not appropriate for certain land uses (backyards, sandboxes).

Removal and Replacement of Bare Soil

Removal and replacement of bare soil involves removing the top 2 – 6 inches of lead contaminated soil; disposing of it in accordance with federal and state standards; and

putting new soil in its place. The advantage of removal and replacement is that it permanently removes the source of lead by taking it off-site. The disadvantage of removal and replacement is that the soil must be tested to determine if it is a hazardous waste or not and that it can generate lead dust if not contained. The EPA 403 Rule states that the soil that is removed shall not be used as top soil at another residential property or child-occupied facility.

HAZARD CONTROL OPTIONS: INTERIM CONTROLS

Because the cost of abatement can be prohibitively expensive, Interim Controls are another option to consider. Interim Controls are intended to make dwellings "lead safe" by temporarily controlling lead based paint hazards, as opposed to abatement, which is intended to permanently remove lead or lead hazards. Interim control measures are fully effective only if they are carefully monitored, maintained, and periodically reevaluated by a licensed risk assessor. If interim controls are properly maintained, they can be effective indefinitely. As long as surfaces are covered with lead based paint, however, they constitute potential hazards.

Interim Control measures include:

- paint film stabilization
- friction–impact reduction treatments
- specialized cleaning (also called dust removal)
- education of tenants and landlords

Paint film stabilization

Paint film stabilization repairs deteriorated paint and creates a new, intact painted surface. In the HUD "lead Safe Work Practice Regulation" (24 CFR Part 35 et.al.), this technique is referred to as paint stabilization and the following specific guidance on what must be included is given for paint stabilization;

(1) Interim control treatments used to stabilize deteriorated lead-based paint shall be performed in accordance with the requirements of this section. Interim control treatments of intact, factory applied prime coatings on metal surfaces are not required. Finish coatings on such surfaces shall be treated by interim controls if those coatings contain lead based paint.

(2) Any physical defect in the substrate of a painted surface or component that is causing deterioration of the surface or component shall be repaired before treating the surface or component. Examples of defective substrate conditions include dry-rot, rust, moisture-related defects, crumbling plaster, and missing siding or other components that are not securely fastened.

(3) Before applying new paint, all loose paint and other loose material shall be removed from the surface to be treated. Acceptable methods for preparing the surface to be treated include wet scraping, wet sanding, and power sanding performed in conjunction with a

HEPA filtered local exhaust attachment operated according to the manufacturer's instructions.

(4) Dry sanding or dry scraping is permitted only in accordance with § 35.140(e) (i.e., for electrical safety reasons or for specified minor amounts of work).

(5) Paint stabilization shall include the application of a new protective coating or paint. The surface substrate shall be dry and protected from future moisture damage before applying a new protective coating or paint. All protective coatings and paints shall be applied in accordance with the manufacturer's recommendations.

(6) Paint stabilization shall incorporate the use of safe work practices in accordance with § 35.1350.

The advantages of paint film stabilization are that the cost is typically lower than abatement, and it can be performed by trained but relatively unskilled personnel. The disadvantages are that it is not an appropriate control for severely damaged substrates, high wear areas, or friction-impact surfaces. Surface preparation and repair of substrates may generate large amounts of leaded dust and on-going monitoring is essential to maintain a lead-safe environment.

It is important to note that certain paint removal practices are prohibited because they create excessive risks to workers and occupants, they are difficult to clean up, and effective substitutes are available. The practices prohibited by HUD are listed in 24 CFR

Part 35.

Friction/Impact Surface Treatment

Examples of building components that may contain friction or impact surfaces include the following:

- Window systems;
- Doors;
- Stair treads and risers;
- Baseboards;
- Drawers and cabinets; and
- Porches, decks, interior floors, and any other painted surfaces that are abraded, rubbed, or impacted.

According to HUD, friction surface means an interior or exterior surface that is subject to abrasion or friction, including, but not limited to, certain window, floor, and stair surfaces. Friction surfaces can be treated either by covering the surfaces with an abrasion resistant material to eliminate the friction surface or by repairing the component to good working condition so that less dust is created. (See Chapter 11 of the HUD Guidelines.)

Impact surfaces can be protected by placing barriers in front of the impact surface.

Some examples of impact surface treatment are new shoe molding in front of baseboards; new chair rail to protect lead-based painted walls from jolts by the backs of chairs; corner molding over outside comers of walls; and door stops can be replaced.

HUD Lead Safe Work Practice Requirements:

According to HUD Lead Safe Work Requirements, friction surfaces are required to be treated only if:

(i) Lead dust levels on the nearest horizontal surface underneath the friction surface (e.g., the window sill, window trough, or floor) are equal to or greater than the standards specified in 35.1320(b);

(ii) There is evidence that the paint surface is subject to abrasion; and

(iii) lead based paint is known or presumed to be present on the friction surface.

Interim control treatments for friction surfaces shall eliminate friction points or treat the friction surface so that paint is not subject to abrasion. Examples of acceptable treatments include rehanging and/or plaining doors so that the door does not rub against the door frame, and installing window channel guides that reduce or eliminate abrasion of painted surfaces. Paint on stair treads and floors shall be protected with a durable cover or coating that will prevent abrasion of the painted surfaces. Examples of acceptable materials include carpeting, tile, and sheet flooring.

According to HUD Lead Safe Work Requirements impact surfaces are required to be treated only if:

(i) Paint on an impact surface is damaged or otherwise deteriorated;

(ii) The damaged paint is caused by impact from a related building component (such as a door knob that knocks into a wall, or a door that knocks against its door frame); and

(iii) (iii) Lead-based paint is known or presumed to be present on the impact surface.

Interim control treatments for impact surfaces shall protect the paint from impact. Examples of acceptable treatments include treatments that eliminate impact with the paint surface, such as a door stop to prevent a door from striking a wall or baseboard.

It is important to note that interim controls for impact or friction surfaces do not include covering such a surface with a coating or other treatment, such as painting over the surface, that does not protect lead based paint from impact or abrasion.

Advantages of friction-impact treatments are that the cost may be less than component replacement, and although dust is generated, it is less than for many other controls. The disadvantages are that the workers must have experience in the construction skills necessary and if windows are repaired, containment is usually required to control dust exposures.

Dust Removal/Specialized Cleaning

Dust removal/specialized cleaning are often used interchangeably and actually employ the same cleaning sequence. However, dust removal is when the cleaning is done as a stand alone interim control. Specialized cleaning is performed at the end of all lead hazard control and as part of **LEAD SAFE WORK PRACTICE** requirements. Both involve extensive and specialized cleaning. In general, they are most effective if the surfaces are "cleanable" (i.e., smooth and intact, thus making dust accessible for cleaning). Undertaking dust removal without controlling the source of the dust is not generally recommended, since removal only cleans up existing lead contaminated dust and does not prevent the dust problem from arising again. Dust removal as the only control may be appropriate when the lead source is no longer active (e.g., old lead smelter or nearby building demolition).

Specialized cleaning (§35.1345)

After hazard reduction activities have been completed, the worksite shall be cleaned using cleaning methods, products, and devices that are successful in cleaning up dust-lead hazards, such as a HEPA vacuum or other method of equivalent efficacy, and lead-specific detergents or equivalent.

Dust-lead hazard control (§35.1345)

(1) Interim control treatments used to control dust-lead hazards shall be performed in accordance with the requirements of this section. Additional information on dust removal is found in the HUD Guidelines, particularly Chapter 11 (see § 35.1310).

(2)Dust control shall involve a thorough cleaning of all horizontal surfaces, such as interior window sills, window troughs, floors, and stairs, but excluding ceilings. All horizontal surfaces, such as floors, stairs, window sills and window troughs, that are rough, pitted, or porous shall be covered with a smooth, cleanable covering or coating, such as metal coil stock, plastic, polyurethane, or linoleum. (3) Surfaces covered by a rug or carpeting shall be cleaned as follows:

- ✓ The floor surface under a rug or carpeting shall be cleaned where feasible, including upon removal of the rug or carpeting, with a HEPA vacuum or other method of equivalent efficacy.
- ✓ An unattached rug or an attached carpet that is to be removed, and padding associated with such rug or carpet, located in an area of the dwelling unit with dust-lead hazards on the floor, shall be thoroughly vacuumed with a HEPA vacuum or other method of equivalent efficacy. Protective measures shall be used to prevent the spread of dust during removal of a rug, carpet or padding from the dwelling. For example, it shall be misted to reduce dust generation during removal. The item(s) being removed shall be wrapped or otherwise sealed before removal from the worksite.
- ✓ An attached carpet located in an area of the dwelling unit with dust-lead hazards on the floor shall be thoroughly vacuumed with a HEPA vacuum or other method of equivalent efficacy if it is not to be removed

The advantages of dust removal are that normal supplies can be used, with the addition of a HEPA vacuum, and the cleaning can be completed relatively quickly and easily. Dust removal directly removes the hazard implicated as the highest cause of childhood lead poisoning. The disadvantages are that cleaning is only effective on fairly smooth, "cleanable" surfaces, and this technique will not be effective at reducing exposures for very long if the source of the dust is not controlled.

Education

Education of both the landlord and the tenant can be, in some cases, a very effective measure for reducing childhood exposures. If the landlord understands the implementation of lead safe work practices and necessary controls into his normal maintenance procedures, control of exposures can become routine. Additionally, if the tenant understands how hand-washing and attention to cleaning and condition of child play areas is important in reducing exposures, the two groups working towards the same goal can provide a safer living environment and higher property values.

When Are Interim Controls Appropriate?

Interim controls are most easily implemented when most LBP surfaces are intact and structurally sound, and if the lead exposure comes primarily from small particles of deteriorating paint and from levels of lead in household dust and/or soil. Interim controls are also appropriate if the housing unit is slated for demolition or renovation within a few years. Interim controls are very effective only if they are carefully monitored and

maintained and periodically reevaluated by a licensed risk assessor. If properly maintained, interim controls can last indefinitely.

If the housing unit has substantial structural defects or if interior or exterior walls or major components, such as windows and porches, are seriously deteriorated or subject to excessive moisture, interim controls are unlikely to be very effective. Paint cannot be effectively stabilized unless substrates are dry, structurally sound, and waterproof.

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Relocation & Work Preparation

Integral to the abatement planning process is the determination of the need to relocate the occupants and their belongings. This decision is based on health and safety issues rather than convenience or economics, especially when there is a lead-poisoned child, pregnant women, or people with immune deficiencies involved. A rule of thumb is that if the surface of lead paint is to be broken during abatement, occupants and their belongings must be temporarily relocated. Additionally, if construction will result in other hazards (such as exposed electrical wires), residents should be relocated. For properties which receive HUD money for renovation or abatement activities which disturb lead, HUD gives clear guidance on when tenants/families may or may not stay in the dwelling:

§ 35.1345 Occupant protection and worksite preparation.

This section establishes procedures for protecting dwelling unit occupants and the environment from contamination from lead-contaminated or lead containing materials during hazard reduction activities.

(a) *Occupant protection.* (1) Occupants shall not be permitted to enter the worksite during hazard reduction activities (unless they are employed in the conduct of these activities at the worksite), until after hazard reduction work has been completed and clearance, if required, has been achieved. (2) Occupants shall be temporarily relocated before and during hazard reduction activities to a suitable, decent, safe, and similarly accessible dwelling unit that does not have lead-based paint hazards, except if: (i) Treatment will not disturb lead based paint, dust-lead hazards or soil lead hazards; (ii) Only the exterior of the dwelling unit is treated, and windows, doors, ventilation intakes and other openings in or near the worksite are sealed during hazard control work and cleaned afterward, and entry free of dust-lead hazards, soil-lead hazards, and debris is provided; (iii) Treatment of the interior will be completed within one period of 8-daytime hours, the worksite is contained so as to prevent the release of leaded dust and debris into other areas, and treatment does not create other safety, health or environmental hazards (e.g., exposed live electrical wiring, release of toxic fumes, or on-site disposal of hazardous waste); or (iv) Treatment of the interior will be completed within 5 calendar days, the worksite is contained so as to prevent the release of leaded dust and debris into other areas, treatment does not create other safety,

health or environmental hazards; and, at the end of work on each day, the worksite and the area within at least 10 feet (3 meters) of the containment area is cleaned to remove any visible dust or debris, and occupants have safe access to sleeping areas, and bathroom and kitchen facilities. (3) The dwelling unit and the worksite shall be secured against unauthorized entry, and occupants' belongings protected from contamination by dust lead hazards and debris during hazard reduction activities. Occupants' belongings in the containment area shall be relocated to a safe and secure area outside the containment area, or covered with an impermeable covering with all seams and edges taped or otherwise sealed.

(b) *Worksite preparation.* (1) The worksite shall be prepared to prevent the release of leaded dust, and contain lead based paint chips and other debris from hazard reduction activities within the worksite until they can be safely removed. Practices that minimize the spread of leaded dust, paint chips, soil and debris shall be used during worksite preparation. (2) A warning sign shall be posted at each entry to a room where hazard reduction activities are conducted when occupants are present; or at each main and secondary entryway to a building from which occupants have been relocated; or, for an exterior hazard reduction activity, where it is easily read 20 feet (6 meters) from the edge of the hazard reduction activity worksite. Each warning sign shall be as described in 29 CFR 1926.62(m), except that it shall be posted irrespective of employees' lead exposure and, to the extent practicable, provided in the occupants' primary language.

Relocation is obviously the best way to ensure that occupants are not further exposed during control option activities. This is especially crucial with a lead poisoned child. 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 serving as temporary relocation units must be lead-safe. 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 the project. If furniture is not removed during abatement work, it should be protected at all times. As many things as possible should be packed to prevent damage while the work is going on. This includes any breakables, kitchen utensils, and items on top of shelves, tables, or dressers. All large furniture should then be moved into the center of the room, covered with plastic sheeting, and sealed to the floor with duct tape. (Furniture and floor areas should be cleaned prior to covering to prevent recontamination when uncovering takes place.) Area rugs and/or carpeting should be removed or completely covered and sealed with plastic sheeting. Heating and air-conditioning systems should be turned off and vents should be covered and sealed with plastic sheeting.

CLEAN UP

Cleanup is the most important step in controlling spread of dust and debris presently in the residence and that which is generated during control activities. If lead dust is not properly controlled and cleaning performed, especially both during and after hazard control work, the area could be more hazardous than before work began. To minimize the level of hazards present while hazard controls are taking place, daily cleanup, personal cleanup, and final cleanup is recommended. Properties receiving HUD financial assistance are required to use HUD Lead Safe Work Practices. This always includes specialized cleaning at the end of work and clearance testing. Risk assessors that may be involved with abatement projects are trained to perform preliminary and final visual clearance of the work areas prior to collecting clearance samples. This process ensures that all lead control activities, including specialized cleaning, is completed prior to sampling and clearing the area for re-occupancy.

Daily Cleanup:

Daily cleanup prevents the spread of lead dust and makes cleanup at the end of the project much easier. The following should be completed at the end of every project day:

- ✓ Wrap and label any debris or trash;
- ✓ Mops floors and wash exposed surfaces and tools with a solution of water and an all-purposed cleaner or a cleaner made specifically for lead and allow to dry;
- ✓ Vacuum all exposed surfaces and plastic sheeting with a HEPA filter-equipped

vacuum cleaner;

- ✓ Mist outside areas using a garden hose before sweeping with a broom. Avoid dry sweeping since it spreads lead dust. Shovel, rake, or HEPA debris into heavy-duty plastic bags placed in cardboard boxes for support.

Daily Personal Cleanup:

Licensed contractors should be aware of safety measures regarding cleanup. OSHA has defined required personal hygiene for lead exposure activities. According to OSHA:

A shower facility is required when employees are exposed above the permissible exposure limit (PEL) and during initial exposure assessment for trigger tasks. Employers must provide a shower adjacent to the worksite if feasible. A clean changing and eating area are mandatory. Employees are required to shower before leaving the worksite, as well as leaving contaminated clothing.

Final Cleanup:

Final cleanup, called *Specialized Cleaning*, which takes places at the end of a project, must be performed slowly and carefully. It should occur no sooner than 1 hour after the project is completed. This allows time for lead dust to settle. Here are the steps of the final cleanup process:

- ✓ Collect waste and debris and wrap in such a way as to contain dust.
- ✓ Carefully remove any plastic sheeting by rolling or folding inward;
- ✓ Vacuum all exposed surfaces with a HEPA filter-equipped vacuum cleaner

- ✓ Wash all surfaces with a solution of water and an all-purpose cleaner or a cleaner made especially for lead. Allow to dry;
- ✓ Vacuum (second time) all exposed surfaces with a HEPA filter-equipped vacuum cleaner.

After all of the above is completed, no visible dust should remain.

CLEARANCE & REEVALUATION

After the completion of any lead hazard control measure, a clearance evaluation should take place to determine if:

- The hazard control work was completed as specified;
- The cleaning was successful; and
- The area is safe for residents and young children to occupy.

Once clearance is established, regular monitoring and reevaluations should take place to ensure that the hazard control is still intact and that LPB hazards have not reappeared. Interim controls require more frequent monitoring than abatement since they are designed as short-term measures. Ongoing monitoring is a systematic approach for ensuring that dwelling units remain free of lead hazards through the evaluation of potential hazards and the management and maintenance of the LBP that remains in the unit. This means checking paint conditions, levels of lead in the dust and soil, and the integrity of the control methods on a regular basis. Clearances and reevaluations should be performed by a licensed risk assessor.

A clearance evaluation occurs in two phases: 1) preliminary and final visual examination and 2) environmental sampling. Clearance is established once sampling results are below EPA/HUD established limits.

Preliminary Visual Examination:

The preliminary visual inspection takes place after preliminary cleanup is completed. Preliminary cleanup involves removal of plastic sheeting used for containment during the abatement, followed by HEPA vacuuming of the area, and washing with a detergent solution. The inspector should then visually inspect the affected area to ensure that abatement has been performed on all surfaces requiring it, and that all visible dust and debris have been removed. If the results of the visual inspection are unsatisfactory, further abatement must be performed as necessary and/or surface must be re-cleaned until satisfactory results are achieved.

Following satisfactory completion of the preliminary inspection, final cleanup is carried out. This involves painting and sealing of all abated surfaces, including all floors whether abated or not followed by HEPA vacuuming, washing, and a second HEPA vacuuming. This is followed by a final inspection, with two purposes to ensure that the abatement work is complete (no paint requiring abatement remains in the dwelling), and, even more important, to be sure that lead levels in surface dust in the dwelling are reduced to acceptably low levels. Thus, there are two stages to the final inspection:

• Final visual inspection; and

• Surface dust sampling.

The final visual inspection determines that the abatement exactly followed the abatement plan. Special attention should be paid to the following potential problem areas:

- Areas where lead paint has been removed adjacent to intact paint:
  - An example is where paint is removed from a door frame but not from the adjacent wall. The boundary between the abated and unabated areas must be sound.
- Windows:
  - These should be checked for paint in hard-to-reach areas, especially sills, thresholds, the tops of parting bead areas, and under the lips of window sills.
- Sealing and repainting.
  - All abated areas should be repainted or otherwise sealed.

Clearance Wipe Sampling for Lead in Dust

There are presently Federal (EPA) standards for lead in surface dust. There are separate clearance standards for floors, window sills, and window wells, because of differences in lead levels, abatement techniques, and ease of cleanup on the three types of surfaces. The clearance standards for single wipe samples are:

FLOORS: 40 micrograms per square fool (µg/ft²)

WINDOW SILLS: 250 micrograms per square foot (µg/ft²)

WINDOW WELLS: 400 micrograms per square fool (µg/ft²).

The required method for testing surfaces is dust wipe sampling. However, before dust wipe samples are taken, the surfaces should be visually inspected to check for dust. If dust is visible, the area should be re-cleaned before wipe sampling. Because virtually all airborne dust settles within 1 hour, dust wipe sampling should not be conducted until at least 1 hour after the completion of final cleaning.

*Note –Dust wipe sampling must be carried out in a carefully controlled manner in accordance with the dust wipe protocol included within this document.

Number and Location of Wipe Samples

The EPA (Lead; Identification of Dangerous Levels of Lead; Final Rule) details the required number of clearance dust wipe samples that must be taken. For an abatement using a containment area, a floor, window sill and window well wipe samples must be taken in no less than four rooms, hallways or stairwells. In addition, one dust wipe sample must be taken from the floor outside the containment area. For abatement

without a containment area, two dust wipe samples (one from a window sill or well and one floor) shall be taken from each of no less than four rooms, hallways or stairwells in the residential dwelling or child-occupied facility.

The exact location to be sampled should be randomly selected. For example, randomly select a location within a room for the floor sample. Likewise, if a room has several windows, randomly select a window sill and a window well (independently) for sampling. A random number generator on a band-held calculator, or a table of random numbers are useful tools for accomplishing random selection.

Soil Sampling & Reevaluation:

Soil sampling is typically not conducted for ongoing reevaluation since a visual examination will enable risk assessors to ascertain if previously covered areas bare now or if interim control measures used to cover contaminated soil are still intact.

Reevaluation

Reevaluations are simply risk assessments with more limited sampling. They include a detailed visual examination of paint films and existing hazard controls, and limited interior dust sampling. All reevaluations should be documented and provided to the owner/tenant in a written summary. If any LBP hazards (either new or failed control measures) are found, recommend acceptable options for controlling the hazard.

Reevaluation Frequency

Reevaluation frequency is determined by the ongoing monitoring schedule and is based on lead-based paint hazards identified during the EIBL investigation and control option chosen. A complete chart is included under the EIBL investigation example found in the appendix.

Reporting:

- Refer to the appendix for an example of a clearance report.

Glossary

Abatement:
Any measure or set of measures designed to permanently eliminate lead-based paint hazards.

Bare Soil:
Soil not covered with grass, sod, some other similar vegetation, or paving, including the sand in sandboxes.

Blood-Lead Level:
A measurement of how much lead is in your blood. This is usually given in units of micrograms per deciliter.

Building Component:
Any element of a building that may be painted or have dust on its surface, e.g., walls, stair treads, floors, railings, doors, window sills, etc.

Chelation:
A medical treatment for lead poisoning. Chelation can be painful and dangerous. It must be given to you by a specially trained doctor.

Chemical Stripping:
A paint removal method that uses chemicals to strip off paint.

Chewable Surface:
Any painted surface that can be chewed or mouthed by a young child. A chewable surface is usually a protruding, horizontal part of a building, such as an interior window sill.

Child-Occupied Facility (COF):
A building, or portion of a building, constructed prior to 1978, visited by the same child, 6 years of age or under, on at least 2 different days within any week, provided that each days visit lasts at least 3 hours, the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours.

Common Area:
A room or area that is accessible to all residents in a community (e.g., hallways or lobbies); in general, any area not kept locked.

Containment:
A process to protect workers and the environment by controlling exposures to the lead-contaminated dust and debris created during abatement.

Deteriorated Lead-Based Paint:
Any lead-based paint coating on a damaged or deteriorated surface or fixture, or any

interior or exterior lead-based paint that is peeling, chipping, blistering, flaking, worn, chalking, alligatoring, cracking or otherwise becoming separated from the substrate.

Disposal (of hazardous waste):
The discharge, deposits, injection, dumping, spilling, leaking or placement of solid or hazardous waste on land or in water so that none of its constituents can pollute the environment by being emitted into the air or discharged into a body of water, including groundwater.

dl:
Short for "deciliter. "A deciliter is a little less than half of a cup. The level of lead in your blood is usually measured in micrograms (µg) of lead per deciliter (dl) of blood.

Dripline:
Area along ground perimeter of house where run off from the roof is deposited.

Dust Removal:
A form of interim control that involves initial cleaning followed by periodic monitoring and re-cleaning as needed. Depending on the severity of lead-based paint hazards, dust removal may be the primary activity or just one element of a broader control effort.

Encapsulation:
Any covering or coating that acts as a barrier between lead-based paint and the environment, the durability of which relies on adhesion and the integrity of the existing bonds between multiple layers of paint and between the paint and the substrate.

Enclosure:
The use of rigid, durable construction materials that are mechanically fastened to the substrate to act as a barrier between the lead-based paint and the environment.

Friction Surface:
Any interior or exterior surface that is subjected to abrasion.

Gram:
A metric unit of weight. A penny weighs about 2 grams. The abbreviation of gram is "g."

Heat Gun:
A device capable of heating lead-based paint causing it to separate from the substrate. For lead hazard control work, the heat stream leaving the gun should not exceed 1,100° F (some authorities may use a different temperature).

High-Efficiency Particulate Air (HEPA) Filter:
A filter capable of removing particles of 0.3 microns or larger form air at 99.7 percent or greater efficiency.

Impact Surface:
A surface (e.g., stair risers) subject to damage by repeated impact or contact.

Inspection (Lead-based paint inspection):
A surface by surface investigation for the presence of lead-based paint conducted by a licensed inspector technician or inspector/risk assessor according to the VA Lead-Based Paint Activities Regulations.

Inspector:
An individual who has completed training from an accredited program and been licensed or certified by the appropriate state or local agency to: 1) perform inspections to determine and report the presence of lead-based paint on a surface-by-surface basis through on-site testing; 2) report the findings of such an inspection; 3) collect environmental samples for laboratory analysis; 4) perform
clearance testing; and 5) document successful compliance with lead-based paint hazard control requirements or standards.

Interim Controls:
A set of measures designed to reduce temporarily human exposure or likely exposure to lead-based paint hazards, including specialized cleaning, repairs, maintenance, painting, temporary containment,
ongoing monitoring of lead-based paint hazards or potential hazards, and the establishment and operation of management and resident education programs.

Investigation (Lead Investigation):
The use of various techniques to identify the source or possible source of a lead hazard where a lead poisoned child is involved.

Lead:
A bluish white metallic element found mostly in combination with another metal. Used in pipes, batteries, solder, and shields against radioactivity.

Lead Paint Hazard:
A condition in which exposure to lead from lead-contaminated dust, lead-contaminated soil or deteriorated lead-based paint would have an adverse effect on human health.

Lead-Based Paint Hazardous Control:
Activities to control and eliminate lead-based paint hazards, including interim controls, abatement and complete abatement.

Lead-Based Paint:
Paint, varnish, shellac or other surface coatings that contain 1.0 mg\cm^2 or more of lead or are 0.5% lead by weight. Lead Contaminated Dust: Surface dust in residences that contains an area or mass concentration of lead in excess of the standard established by the EPA.

Lead Dust:
Dust or debris that is contaminated with lead particles. Lead dust is created when lead paint is disturbed, damaged or deteriorated.

Lead-Free Dwelling:
A lead-free dwelling contains no lead-based paint and has interior dust and exterior soil lead levels below the applicable HUD and EPA standards.

Lead Hazard Screen:
A means of determining whether residences in good condition should have a full risk assessment. Also called a risk assessment screen.

Lead Paint Hazard:
Any condition that causes exposure to lead from lead dust, soil paint that would cause ill health.

Lead Poisoned:
Absorption of lead in the human body to cause adverse health effects.

Licensed:
Risk assessors, inspectors, and abatement contractors in the state of Virginia should be licensed by the VDPOR to safely undertake risk assessments, inspections, and abatement work.

Micrograms:
The prefix micro means one-millionth; a micro-gram is 1/1,000,000 of a gram. µg\dl: Micrograms (µg) per cubic meter (m3). Lead in the air is measured in this way.

Occupied Area:
A building, or portion of a building, constructed prior to 1978, visited by the same person, on at least 2 different days within any week, provided that each days visit lasts at least 3 hours, the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours.

Paint Removal:
An abatement strategy that entails the removal of lead-based paint from surfaces. For lead hazard control work, this can mean using chemicals, heat guns below 1,100° F, and certain contained abrasive methods.

PEL:
Short for "Permissible Exposure Limit." This is the maximum amount of lead that the OSHA Lead Standard says you can breathe over an 8-hour shift. The PEL for lead is 50 micrograms of lead for every cubic meter of air ($\mu g \backslash m^3$).

Polyethylene Plastic:
All references to polyethylene plastic refer to 6-mil plastic sheeting or polyethylene bags (or doubled bags using 4-mil polyethylene bags).

ppm:
Stands for "parts per million." For example, paint that is 600 ppm lead has 600 parts of lead for every million parts of paint.

Priming:
To prepare a surface for painting.

Renovation:
Work that involves construction and/or home or building improvement measures such as window replacement, weatherization, remodeling and repainting.

Replacement:
A strategy of abatement that entails the removal of building components coated with lead-based paint (such as windows and doors) and the installation of new components free of lead-based paint.

Resource Conservation Recovery Act (RCRA):
The primary Federal statute governing waste management from generation to disposal. RCRA defines the criteria for hazardous and nonhazardous waste.

Risk Assessment (Lead Hazard Risk Assessment):
An on site investigation conducted by a certified inspector/risk assessor in accordance with VA Lead-Based Paint Activities Regulations to determine the existence, nature, severity, and location of lead and lead-based paint hazards, and the provisions to the property owner/occupant of a report explaining the results of the investigation and providing options for reducing those hazards with a rationale for those options.

Risk Assessment Screen:
A type of risk assessment performed only in buildings in good condition using fewer samples but more stringent evaluation criteria (standards) to determine lead hazards.

Risk Assessor:
A certified individual who has completed training with an accredited training program and who has been certified to 1) perform risk assessments; 2) identify acceptable abatement and interim control strategies for reducing identified lead-based paint hazards; 3) perform clearance testing and reevaluations; and 4) document the successful completion of lead-based paint hazard control activities.

Sample Collection Container:
Container for holding and transporting the samples from the field to the laboratory. The internal volume of the container must be sufficient to hold the entire collected sample.

Sampling Location:
Specified area within a sampling site that is subjected to sample collection. Multiple sampling locations are commonly designated for a single sampling site. An example would be at the bottom of a specific slide in a specific playground area.

Sampling Site:
Local geographical area that contains the sampling locations. A sampling site is generally limited to an area that can be easily covered on foot. An example would be John Smith's house 3102 Nowhere Avenue, Detroit, MI

Screening:
The process of testing children to determine if they have elevated blood-lead levels.

Substrate:
A surface on which paint, varnish, or other coating has been applied or may be applied. Examples of substrates include wood, plaster, metal, drywall, etc.

Target Housing:
Any residential unit constructed before 1978, except dwellings that were developed specifically for the elderly or persons with disabilities unless a child younger than six years resides or is expected to reside in the dwelling.

Title X:
The Lead Hazard Reduction Act of 1992. It requires the government to regulate people's exposure to lead much more closely.

mg\ft^2:
Micrograms (µg) per square foot (ft^2) of area. Dust samples measure lead in a certain area in micrograms per square feet.

Window Trough:
For a typical double-hung window, the portion of the exterior window sill (or stool) and the frame of the storm window.

Window Well:
The space that provides exterior access and/or light to a window that is below grade, i.e., below the level of the surrounding earth or pavement.

XRF Analyzer:
An instrument that determines lead concentration in milligrams per square centimeter (mg/cm^2) using the principle of x-ray fluorescence (XRF).

ACRONYMS

BLL	Blood Lead Level
BOCA	Building Officials and Code Administrators
CDC	Centers for Disease Control
CFR	Code of Federal Regulations
CLPPP	Childhood Lead Poisoning Prevention Program
COF	Child-Occupied Facility
CPSC	Consumer Product Safety Commission
DEQ	Department of Environmental Quality
DLI	Department of Labor and Industry
DPOR	Department of Professional & Occupational Regulation
EIBL	Elevated Blood Lead Level
EHS	Environmental Health Specialist
EPA	Environmental Protection Agency
HEPA	High Efficiency Particulate Air
HUD	U.S. Department of Housing and Urban Development
LBP	Lead-Based Paint
NLLAP	National Lead Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
PCS	Performance Characteristics Sheet
PHN	Public Health Nurse
ppb	parts per billion
PPE	personal protection equipment
ppm	parts per million

RadMat	Radiation Material
RHP	Radiological Health Program
RSO	Radiation Safety Officer
TLD	Thermoluminescent Dosimeter
TSP	Tri-Sodium Phosphate
USBC	Uniform Statewide Building Code
VDH	Virginia Department of Health
VDPOR	Virginia Department of Professional and Occupational Regulations
VRPR	Commonwealth of Virginia Radiation Protection Regulations
XRF	X-ray Fluorescence

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