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Student Manual

Lead-Based Paint Risk Assessment Model Curriculum

Prepared by:

The National Center for Lead-Safe Housing

For:

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Robert M. Jordan, Project Manager

Chemical Management Division

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This document was prepared by:

Contributing authors:

Vicki Hanrahan Ainslie, Georgia Institute of Technology

Sharon Cameron, Massachusetts Lead Poisoning Prevention Program

Claudia Huff, Georgia Institute of Technology

Dave Jacobs, National Center for Lead-Safe Housing

Dennis Livingston, Community Resources

Ellen Tohn, Alliance to End Childhood Lead Poisoning

Kathleen Vork, Alameda (California) Lead Poisoning Prevention Program

Jonathan Wilson, National Center for Lead-Safe Housing

Layout and copy editing by:

Susan Archie, Desktop Services and Solutions

Stephanie Babbitt, Georgia Institute of Technology

Art work:

Rae Adams, Georgia Institute of Technology

Eliesh O'Neil Lane, Georgia Institute of Technology

Dennis Livingston, Community Resources

Instructor notebook and visual aids:

Rae Adams, Georgia Institute of Technology

Vicki Hanrahan Ainslie, Georgia Institute of Technology

Stephanie Babbitt, Georgia Institute of Technology

Eliesh O'Neil Lane, Georgia Institute of Technology

Myrtle Turner-Sippio, Georgia Institute of Technology

Pilot course conducted by:

University of Maryland at Baltimore Regional Lead Training Center, Barbara Sattler, Director

Peer Review Panel

Al Buzzetti, Connecticut Health Department

Patrick Connor, Connor Environmental

Gil Copley, St. Louis Lead Poisoning Prevention Program

Nick Farr, The National Center for Lead-Safe Housing

Jim Keck, Leadtec Services

Miles Mahoney, Housing Environmental Services

Jim McCabe, Leadtec Services

Clark McNutt, Environmental Restoration, Inc.

Mary McKnight, National Institute for Standards and Technology

Brad Prenney, Massachusetts Lead Poisoning Prevention Program

Rick Rinehart, Westat

Kathleen Vork, Alameda (California) Lead Poisoning Program

Federal Government Panel Members

Barbara Haley, HUD

Mark Henshall, EPA

Jonathon Jacobson, EPA

Robert Jordan, EPA, CMD/FPB

Gary Noonan, CDC

Brad Schultz, EPA, CMD/TPB

Dave Topping, EPA, CMD/PDB

Darlene Watford, EPA, CMD/TPB

Steve Weitz, HUD

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SECTION 1

Course Overview

Course Prerequisites

Students taking this EPA Lead-based Paint Risk Assessment course should have already completed the EPA Lead-based Paint Inspector course (or equivalent). The risk assessment course does not repeat the contents of the inspector course.

This course is designed for individuals from a broad variety of backgrounds and interests. Its primary purpose is to teach individuals seeking certification as lead-based paint risk assessors to conduct risk assessment services. The EPA has determined that a risk assessor must have a certain minimum level of experience and/or education in a related field to be eligible for certification under 40 CFR 745.

EPA also recommends that the lead-based paint abatement supervisor course be completed by risk assessors. That course provides much greater detail on hazard control methods.

Course Objectives

At the end of this course, students should be able to

- define lead-based paint risk assessment;
- follow the steps in the EPA and HUD lead-based paint risk assessment protocol.

Specifically, after completing the various sections in this curriculum, students should be able to

Section 2

- describe the differences between lead-based paint risk assessments and
  - inspections
  - clearance examinations
  - investigations of houses with children who have elevated blood lead levels
  - reevaluations;
- describe when to use the lead hazard screen protocol (a type of risk assessment);
- describe the scope and limitations of a lead-based paint risk assessor's role;

Section 3

- clearly describe the scope and limitations of lead-based paint risk assessment and inspection;

Sections 4, 5, 6, 7, 8

- follow and demonstrate the sampling procedures for dust, soil, deteriorated paint, and water;
- follow the visual assessment procedures for paint films and building conditions that result in lead-based paint hazards;

Sections 9, 10

- clearly describe and demonstrate the procedures for conducting a lead hazard screen using the protocol taught in this course;
- follow the procedure for performing risk assessments in multi-family housing;

Course Objectives

Sections 11, 12

- choose EPA-recognized laboratories for analyzing environmental samples;
- correctly interpret sampling results and all other data collected;
- clearly describe the procedures for determining a reevaluation schedule and an ongoing monitoring program (if applicable);
- develop options for owners to control identified hazards, including both interim control and abatement options in specific circumstances, and indicate when certain control options should not be used;

Section 13

- follow the steps in the HUD *Guidelines* for investigating housing in which a child with an elevated blood lead level is residing;

Section 14

- use the communication techniques taught in this course to educate owners and residents on lead-based paint hazards, when appropriate;

Section 15

- document procedures used to identify hazards, control measures, and reevaluation schedules for specific properties in a standard report format.

Key Definitions

Risk assessment: An on-site investigation of a residential dwelling for lead-based paint hazards. Risk assessment includes investigating the age, history, management, and maintenance of the dwelling; conducting a visual assessment; performing limited environmental sampling, such as dust wipe samples, soil samples, and deteriorated paint samples; and reporting the results that identify acceptable abatement and interim control strategies based on specific conditions and the owner's capabilities.

Inspection: A surface-by-surface investigation for determining the presence of lead-based paint (and in some cases sampling for lead in dust and soil) and a report of the results.

Lead-based paint: Any paint, varnish, shellac, or other coating that contains lead equal to or in excess of 1.0 mg/cm^2 as measured by an x-ray fluorescence analyzer or laboratory analysis or 0.5 percent by weight (5,000 µg/g, 5,000 ppm, or 5,000 mg/kg) by laboratory analysis. (Local definitions may differ.)

Lead-based paint hazard: A condition in which exposure to lead from lead-contaminated dust, lead-contaminated soil, deteriorated lead-based paint, or from lead-based paint present on accessible, friction, or impact surfaces would result in adverse human health effects. Title X of the 1992 Housing and Community Development Act charges EPA with setting national standards for lead-contaminated dust and soil. [Note: definition subject to change in the final EPA rulemaking.]

Prevention measures:

Primary Prevention—lead-based paint risk assessments and/or inspections and abatement and/or interim controls in housing *before* children are poisoned.

Secondary Prevention—blood lead screening programs to identify children who already have elevated blood lead levels.

Tertiary Prevention —medical treatment/management of children to prevent acute injuries or death from lead poisoning.

SECTION 2

Introduction to Risk Assessment

Learning Objectives

After completing this section, students should be able to

- describe the national program goals, purposes, and objectives created by Congress under Title X of the 1992 Housing and Community Development Act;
- identify the regulations and guidelines that form the basis for the systematic approach to housing risk assessments taught in this course;
- name at least one major limitation to lead-based paint housing risk assessments;
- list the minimum experience, training, and education for which this curriculum is geared;
- outline the role of the risk assessor;
- describe how a private risk assessor should coordinate certain situations with the local health department;
- summarize the differences between inspections, risk assessments, clearance examinations, and elevated blood lead (EBL) investigations;
- name seven major steps in the risk assessment process;
- outline at least three other types of lead-based paint hazard evaluations;
- describe two major reasons for recommending cost-effective services and hazard control strategies to a property owner.

Legislative Basis for Lead-based Paint Risk Assessments

In 1992 Congress passed Title X of the Housing and Community Development Act. The three major purposes of the Title X legislation with respect to lead-based paint hazards in United States housing are

- to build the national infrastructure necessary to eliminate lead-based paint hazards in housing as expeditiously as possible;
- to reorient the national approach to the presence of lead-based paint in housing by implementing a targeted program to evaluate and control lead-based paint *hazards* in the nation's housing stock;
- to encourage effective action to prevent childhood lead poisoning by establishing a workable framework for lead-based paint hazard evaluation and reduction and by ending the current confusion over reasonable standards of care.[1]

The exposure-based approach articulated by Congress in Title X is based on good science. It focuses attention and resources on where they are needed most, based on information obtained through systematic data collection, analyses, and evaluation processes. The risk assessment process is an important step toward solving the lead-poisoning epidemic that now afflicts an estimated 1.7 million children, while maintaining the nation's stock of affordable housing.

[1]U.S. EPA, Lead: Requirements for Lead-based Paint Activities; Proposed Rule, 40 CFR Part 745, Vol. 59, No. 170, 2 September 1994.

Title X: An Exposure-oriented Mandate

What does it mean to say that in Title X Congress wanted an exposure-based approach to solving our lead poisoning problem? Although the inspector course is aimed at teaching some of the analytical methods used for determining if lead-based paint is present, this risk assessment course explains how exposures to lead-based paint hazards are occurring right now. In addition to paint lead concentration, we need to know other things as well, such as:

- the condition of that paint;
- the various pathways through which exposure to lead-based paint occurs, such as dust and soil;
- likely sources of exposure;
- future plans for the dwelling (such as maintenance and rehabilitation or other activities that might disturb lead-based paint).

It is possible to have high dust lead levels but no deteriorated paint. Similarly, deteriorated lead-based paint may be present, but levels of lead dust may be quite low. Such conditions make it necessary for persons conducting risk assessments to measure several different sources and pathways of lead exposure.

Owners will want to know more than whether or not some surfaces contain more or less than 1 mg/cm^2 of lead. Owners typically want some advice on how they can go about solving any immediate problems identified; some idea of how much each solution will cost; and options for long-range planning to control potential hazards. Risk assessment and inspections are separate but complementary activities.

History of Lead-based Paint Risk Assessments

Housing-based risk assessments for lead-based paint hazards emerged in response to an insurance problem in the nation's public housing program. Risk assessments were first conducted on a nationwide basis in public housing, where the shortcomings of only measuring lead concentrations in paint were first seen. Under earlier mandates, Congress required all Public and Indian Housing Authorities to complete inspections of their pre-1978 family dwellings by December 1994. If lead-based paint levels were equal to or greater than 1 mg/cm^2, abatement was required.

However:

- No deadline was given for when abatement was to occur and be completed.
- No abatement funds were available except through the public housing modernization program; many housing authorities were not slated to undertake rehabilitation for some of their housing developments for five, ten, even fifteen years.

This created a crisis. Housing authorities had reports identifying existing "hazards" but no ability to do anything about them. The Housing Authority Risk Retention Group (HARRG), a nonprofit insurance company mutually owned by many of the nation's largest public housing authorities, decided to meet this crisis by providing lead-based paint insurance but only if the housing authority could manage the immediate risk by controlling exposures. In other words, risk assessment comes out of the insurance field, where it is coupled with a risk management program.

After completing a risk assessment and appropriate controls, housing authorities had evidence that any lead poisoned child who was identified (subsequent to the housing authority's implementation of short-term hazard controls) was likely poisoned from another source. This meant that

- the authority has a substantive defense against lawsuits;
- lead-safe housing was created in the short term;
- the lead-based paint insurance problem became manageable.

Congress provided $25 million for risk assessments to be carried out in public and Indian housing, in addition to the standing requirement for inspections to be completed. Inspections were to have been completed by December 1994. There is no deadline for completing risk assessments in public housing.

Title X also indicates that risk assessments and/or inspections will be carried out through a number of federally assisted housing programs.

History of Lead-based Paint Risk Assessments

The public housing risk assessment protocol developed first by Housing Environmental Services, the technical services arm of HARRG, was (for the most part) adopted by HUD and published in the *Federal Register* in 1990. It has been modified and updated so that it is applicable to both federally assisted and privately owned housing. This new protocol in the 1995 HUD *Guidelines* provides more detailed guidance specific to the needs of the private sector. The goal is to create a workable system that reduces and controls immediate lead-based paint hazards until permanent abatement measures can be completed. In federally assisted housing permanent abatement is typically performed when sufficient funds become available or when the dwelling is torn down.

A complete description of the history of the lead poisoning problem can be found in the EPA *Lead Inspector Training Course Model Curriculum*, *The Hour of Lead* (from the Environmental Defense Fund in Washington, D.C.), and in "Lead Poisoning: Public Health Warnings Unheeded," Richard Rabin, *American Journal of Public Health* (1989), 79(12):1668-1674).

Definition of Risk Assessment

The typical definition of a "risk assessment" is a quantification of the health effects of exposure to hazardous materials of individuals or populations developed by conducting a hazard identification, a dose-response assessment, an exposure assessment, and a risk characterization.[2] This form of risk assessment focuses on a quantitative analysis of risk to human health and does not recommend risk management options for management of the risk.

Risk assessment, as defined by the Toxic Substance Control Act Title IV (TSCA), differs from this traditional concept in that the risk assessor is relied upon not only to identify but also to describe lead-based paint hazards and also to identify options for the management of these hazards. Section 401(16) of TSCA provides that **the objective of a risk assessment is to determine and then to report the existence, nature, severity, and location of lead-based paint hazards in housing through an on-site investigation and the possible means of correcting any hazards identified.**

The act mandated an exposure-based approach to dealing with lead-based paint hazards. This systematic approach is taken from the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*[3] and U.S. EPA-proposed regulations in 40 CFR 745.[4] The HUD *Guidelines* are part of this student manual and will be referenced throughout the course. Specifically, this course covers Chapters 5, 6, and 16 of the HUD *Guidelines*, as well as some material from Chapter 3. You can obtain a copy of the HUD *Guidelines* by calling HUD at 1-800-245-2691 or the HUD Lead-based Paint Office at 1-202-755-1810.

[2]Risk Assessments in the Federal Government: Managing the Process, National Academy Press.

[3]National Center for Lead-Safe Housing, HUD Guidelines for the Evaluation and Control of Lead-based Paint Hazards in Housing, 1995.

[4]U.S. EPA, Lead: Requirements for Lead-based Paint Activities; Proposed Rule, 40 CFR Part 745, Vol. 59, No. 170, 2 September 1994.

Risk Assessment Tools

Tools and devices for risk assessment typically include the following:

- measuring tape
- camera/film/videorecorder (all optional)
- razor blade
- hammer
- masking tape
- wipe media (baby wipes or other commercially available media)
- plastic (disposable drop cloth)
- heat gun
- flashlight
- disposable gloves
- zip-lock bags (for soil samples)
- hard-shelled containers, such as centrifuge tubes (for wipe samples)
- screw driver
- disposable coverall (optional)
- soil coring/sampling device
- sharp scraper for paint chip samples
- paint chip sample collection trays
- templates
- water sampling containers (optional)
- step stool (optional)
- forms and blank pages for recordkeeping
- labels and permanent markers (for labelling samples)

Risk Assessor's Role and Interface with Other Professionals

The role of the risk assessor is to determine, and then report the existence, nature, severity, and location of lead-based paint hazards in residential dwellings through an on-site investigation. Risk assessors should also provide some advice on how an owner can go about solving any problems identified and some idea of how much each solution will cost. There are several other professionals the risk assessor may deal with while providing services to the property owner. Refer to Chapter 2 of the New HUD *Guidelines* for further discussion of the lead-based paint risk assessor's role in relation to other professionals.[5]

[5]National Center for Lead-Safe Housing, HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, 1995.

Different Forms of Lead Hazard Evaluation

There are important differences between lead-based paint inspections, risk assessments, and poisoned child investigations.

Inspections are a surface-by-surface investigation to find out which surfaces have lead-based paint. These inspections do not identify hazards, measure exposure, or suggest solutions. Inspections are often performed by technicians and do not help the owner design a hazard control plan.

Risk assessments determine the *immediately* available sources of lead in a dwelling and help the owner design a mixture of long-term and/or short-term responses to any hazards found.

Inspections	Risk assessments
• measure the concentration of lead in paint on a surface-by-surface basis	• measure the level of lead in dust and soil and deteriorated paint
• identify the presence of lead-based paint on all components	• identify the location and nature of all lead-based paint hazards (primary prevention)
• allow the owner to avoid treating paint that is not lead-based	• consider information about past maintenance and management practices
	• allow the owner to treat all lead hazards present

These two activities measure different things: inspections measure lead-based paint concentrations, while risk assessments measure lead-based paint hazards.

Neither an inspection nor a risk assessment is designed to investigate the causes of poisoning in the home of a child with an elevated blood lead (EBL) level. Many health departments have established procedures to deal with these cases. It is crucial that a private risk assessor coordinate residential risk assessment or inspection activities with a local health department in the case of a lead-poisoned child. Coordination will avoid

- duplication of effort;
- confusion on the part of the residents and/or property owner over the scope and purpose of the inspection or risk assessment;
- interference with health department jurisdiction.

Chapter 16 in the HUD *Guidelines* contains a procedure typically used by local health department personnel to investigate these cases. This investigation protocol, which is also covered in this course, should be the approach used by the risk assessor if permitted by the local health department. Risk assessors may be called upon to conduct investigations

Different Forms of Lead Hazard Evaluation

by owners or occupants if public health officials do not have the resources to evaluate the case.

Both risk assessments and inspections evaluate the "lead-safe" status of the dwelling, regardless of the health of a child. This is a "primary prevention approach" that determines dwelling lead-based paint hazards *before* a child becomes poisoned.

Special Approaches

Several varieties of risk assessments and inspections are possible, depending on the specific situation:

Lead Hazard Screen

A lead hazard screen is a type of risk assessment that applies to housing in good condition as defined in the HUD *Guidelines*. This type of housing is less likely to contain lead-based paint hazards, so a more limited sampling effort is needed. The purpose of the screen is to determine if a full risk assessment is needed. While fewer samples are collected, the criteria to be used in evaluating dust results are more stringent. The screen will help target resources to those dwellings that need evaluation most.

Combination Risk Assessment/Inspection

In some cases, an owner may want to know where the lead-based paint in a property is actually located and where lead-based paint hazards are located. This process combines a surface-by-surface measurement of lead-based paint with soil and dust sampling to provide the owner with information on what should be done immediately and what can be done later. This is the optimal (although most expensive) approach, because both immediate and potential hazards are identified.

Bypass Hazard Identification

In still other cases, an owner may decide to skip the initial hazard identification step and spend money to control suspected or assumed hazards. In this situation, a risk assessor may be asked to determine if all lead-based paint hazards have been controlled *after* the work has been completed. This can be done by combining the risk assessment process with the clearance process. Clearance is normally performed after cleanup following abatement or interim controls to determine if cleanup was done properly and to determine if all lead-based paint hazards were adequately addressed. If some hazards were overlooked, the risk assessor would recommend additional correction and clearance testing.

Special Approaches

Reevaluations

Reevaluations are needed in dwellings where lead-based paint remains, or is suspected to remain, even if it is presently in a nonhazardous condition. Reevaluations are not needed in dwellings in which owners or managers have established that hazards are unlikely to appear, according to the Standard Reevaluation Schedules in Section 12, "Ongoing Monitoring."

Description of the Risk Assessment Process

The systematic approach to the risk assessment process developed by HUD includes at least seven major steps. The risk assessor must

- determine the most appropriate evaluation process for the owner's dwelling(s);
- obtain background information;
- schedule the evaluation;
- conduct the evaluation;
- determine the actual hazards;
- provide guidance toward reducing or eliminating these hazards;
- produce a written report.

The following is summary of each major step in the risk assessment process. Each step will be examined further in the remainder of this course.

Step 1: Determine whether a risk assessment, inspection, a combination risk assessment/inspection, lead hazard screen, or EBL child investigation makes the most sense.

Let's take an example of how a risk assessment might work from start to end. Suppose an owner calls and asks you to do some testing for lead-based paint. It is important that you find out why the owner wants the testing done to help you focus your investigation. Some of the possible reasons might be:

- regulation requires it;
- parents of lead-poisoned child want help;
- sale of building;
- renovation of building planned;
- owner is sued by a poisoned resident;
- insurance company requires it.

After finding out why the owner wants help and the type of help desired, the risk assessor can determine whether an inspection or risk assessment makes the most sense.

Step 2: Get background information on the dwelling, owner's plans, and resources, and occupants (if present).

Use forms 5.0, 5.6, and/or 5.7 in the HUD *Guidelines* to get the necessary background information.

Description of the Risk Assessment Process

For multi-family housing, data to identify targeted units will be needed. If a single-family home is being investigated, the resident questionnaire can be used.

Step 3: Arrange a date to do the visual examination and environmental sampling. Make any necessary arrangements with the owner to notify residents. Some education on why this work is being done may be necessary, especially if an inspection has already been done. If possible, try to have the owner or owner's representative present during the field visit. The risk assessor should not interfere in any existing landlord/ tenant relations.

Step 4: Conduct environmental sampling, and send samples to an EPA-recognized laboratory.

Step 5: Combine visual findings with environmental sampling results, and determine if hazards are present.

Step 6: Provide owner with a range of options to control any hazards found, along with rough, estimated costs and reevaluation schedules.

Step 7: Document all findings and determinations in a standard report.

Good Practices

Good Public Health Practices

In many cases, it will be up to you, the risk assessor, to determine what the owner really needs and will be able to afford. If only the most expensive options are identified, only the relatively wealthy will be able to afford your services. Lead-based paint hazards are primarily a public health, housing, and environmental problem, and many lead-poisoned children live in low-income areas. It is both poor public health and bad business to suggest services that will raise the cost of housing or cause owners to abandon the effort to identify and remedy lead-based paint hazards. In short, a risk assessor has responsibilities to **both** the owner (client) and the public.

Good Business Practices

To be a successful risk assessor, tailoring the services offered to the needs of your client is essential. If you can control costs, the owner is more likely to ask you to come back and perhaps conduct the clearance testing and/or reevaluation.

Where does this leave you? Does the risk assessment process mean that you have assumed the owner's liability if you failed to identify hazards or options?

Ultimately, owners bear the responsibility for the condition of a property. Owners also must decide what to do (it's their money) and how often to monitor the condition of the property on an ongoing basis.

Risk assessors and inspectors alike can reduce their liability exposure by

- doing a thorough job;
- stating that the presence or absence of lead-based paint hazards applies only to the date of the field visit (and that conditions may change), which is why ongoing monitoring by the owner is usually necessary;
- using and citing the procedures and evaluation process in this course, HUD *Guidelines*, and EPA and HUD regulations as the state-of-the-art procedures.

Exercise #2-1 (Icebreaker)

Instructions: Using numbers 1 through 16, indicate the appropriate sequence for each of the following activities involved in conducting a typical risk assessment:

_____ Select units to sample and components to test.

_____ Decide on hazard screen vs. full risk assessment.

_____ First meeting with occupants/client.

_____ Analyze sampling results.

_____ Write report and recommendations for reevaluation.

_____ Conduct visual assessment, and develop sampling plan.

_____ Receive call requesting a visit.

_____ Identify laboratory, and review their credentials.

_____ Send samples to selected lab.

_____ Second meeting with occupants/client.

_____ Collect background data on property from owner and from records.

_____ Decide on single surface vs. composite sampling.

_____ Develop hazard control plan.

_____ Prepare ongoing monitoring plan and schedule.

_____ Select appropriate test methods (XRF vs. Labs vs. Spot Testing)

_____ Collect samples for water, soil, dust, and paint.

Step-by-step Risk Assessment Summary (from HUD *Guidelines*)

1. The owner or occupant contacts a risk assessor.
2. The risk assessor determines if the owner needs a risk assessment, an inspection, or a combination of the two. The owner and the assessor reach an agreement on costs and scope of effort. If a child with an elevated blood lead level (EBL) is being investigated, the risk assessor uses the protocol in Chapter 16 and/or coordinates with the local health agency. If the dwelling unit was built after 1978 (or if all lead-based paint has been removed and clearance has been established), a risk assessment is not needed. If the dwelling is in relatively good condition, the risk assessor and/or owner may choose to conduct the lead hazard screen risk assessment option. In all other cases, the risk assessor conducts a full risk assessment, paint inspection, a combination of the two, or a risk assessment at the time of clearance.
3. The owner submits information on the type and condition of the building(s) to the risk assessor on standard forms (or the risk assessor completes forms by phone interview).
4. The risk assessor selects dwellings for environmental sampling and visual assessments in *each* unit if assessing owner-occupied, single-family dwellings; fewer than five rental units; or multiple rental units where the units are not similar. If there are five or more similar dwellings, the risk assessor selects a few targeted dwellings for testing and visual assessment, using the criteria in this chapter (see Table 5.6) [or see page 10-8 of this manual].
5. The risk assessor performs a visual assessment of the building and paint condition, using the standard forms and protocols in this chapter, and selects sampling locations based on use patterns and visual observations.
6. The risk assessor conducts dust sampling. Dust samples are typically collected in the entry way, common spaces, the kitchen, the living room, and a child's bedroom and playroom. The risk assessor collects samples from floors, interior window sills (stools), window troughs (window wells), and other suspected surfaces.
7. The risk assessor conducts soil sampling. Soil samples are collected from bare spots in children's play area, near the building foundation (drip line), in gardens, and perhaps the yard.
8. The risk assessor conducts deteriorated paint sampling by collecting all layers of paint (not just the peeling layers) and submits the samples to a laboratory recognized by the U.S. Environmental Protection Agency (EPA) National Lead Laboratory Accreditation

Step-by-step Risk Assessment Summary (from HUD *Guidelines*)

Program (NLLAP). Alternatively, deteriorated paint can be measured by portable x-ray fluorescence (XRF) if the deteriorated paint has a large enough uniform surface with all layers present. Destructive paint chip sampling must always be done after dust sampling so that cross contamination is prevented.

9. At the owner's request, the risk assessor may collect water samples to evaluate lead exposures that can be corrected by the owner (leaded service lines, fixtures). Water sampling is not recommended for routine risk assessments of lead-based paint hazards, since EPA has another existing program in this area. If a lead-contaminated water problem exists beyond the owner's service line, the local water authority should be notified. Air samples are also not recommended for routine lead-based paint risk assessments.

10. The risk assessor teaches the owner or owner's representative how to recognize visually lead-based paint hazards while the risk assessor is conducting the sampling.

11. The risk assessor interprets the laboratory results.

12. The risk assessor integrates the laboratory results with the visual assessment results and other maintenance and management data and determines the presence or absence of lead-based paint hazards, as defined under applicable statute or regulations.

13. The risk assessor discusses the various safe and effective lead hazard control options for specific lead hazards with the owner and determines the most feasible and effective options for the specific situation.

14. The risk assessor prepares a report recommending specific lead hazard control measures, including interim control and abatement options and includes rough cost estimates of specific alternatives, including the costs of reevaluation (if applicable). The owner should be told how to obtain educational materials from EPA, the Occupational Safety and Health Administration (OSHA), and the local childhood lead poisoning prevention program and provides copies of these materials if possible. The report should also indicate which control method the owner has chosen to implement.

15. After lead hazard control work has been completed and clearance has been established, the risk assessor provides any certificates of compliance or other documentation required by federal, state, or local regulation.

Key Concepts

Title X Legislation

The purposes of the Title X legislation are to develop a national infrastructure

- to eliminate quickly lead-based paint hazards in all housing;
- to implement a lead-based paint hazard reduction program;
- to establish a workable framework, infrastructure, and standard of care for lead-based paint hazard evaluation and reduction
- to reduce the threat of childhood lead poisoning in housing owned, assisted, or transferred by the federal government.

History of Lead-based Paint Risk Assessment in Housing

An enormous liability exposure in Public and Indian Housing was created by early legislation mandating lead-paint inspections. A hazard was reported, but there were no resources to correct the hazard.

The Housing Authority Risk Retention Group (HARRG) responded to this situation by providing affordable lead-based paint insurance under the condition that housing authorities complete risk assessments and implement short-term hazard controls.

This HARRG program helped spawn a national program with the overall goal of developing a workable system to reduce and control immediate lead-based paint hazards until permanent abatement measures can be completed when sufficient funds become available or when the dwelling is torn down.

Focusing on lead hazards represented a fundamental shift from the previous strategy of removing all lead-based paint regardless of whether it was proving hazardous to human health.

Differences between Inspections and Risk Assessments

Inspections measure lead-based paint concentrations on a surface-by-surface basis, while risk assessments identify lead-based paint hazards.

Neither an inspection nor a risk assessment is designed to investigate the causes of poisoning in the home of a child with an elevated blood lead level. This type of evaluation is typically performed by local public health officials who are trained to look for a specific source of lead poisoning.

The Risk Assessment Process

Key Concepts

The systematic approach to the risk assessment process developed by HUD includes seven major steps. The risk assessor must

- obtain background information;
- determine the most appropriate evaluation process for the owner's dwelling(s);
- schedule the site visit;
- conduct the evaluation (including visual assessment and environmental sampling);
- determine the actual hazards (if any);
- identify options for reducing or eliminating these hazards;
- produce a written report.

Other Types of Assessments

Screen:

A lead hazard screen is a type of risk assessment that applies to housing in good condition.

Combination:

A combination risk assessment/inspection integrates a surface-by-surface measurement of lead-based paint with soil and dust sampling to provide the owner with comprehensive information on the extent and nature of hazards and what should be done immediately and what can be done later to control these hazards.

Clearance:

A risk assessor may combine a risk assessment with the clearance process to determine if all lead-based paint hazards have been controlled. Clearance is normally performed after cleanup following abatement or interim controls to determine if cleanup was done properly and to determine if all lead-based paint hazards were adequately addressed.

EBL Child Investigation:

This type of investigation is aimed at identifying a source (or sources) of exposure for a specific child.

Key Concepts

Good Public Health and Business Practices

Lead-based paint hazards are a public health, housing, and environmental problem.

It is both poor public health and poor business practice to suggest services that will raise the cost of housing or cause owners to abandon the effort to identify and remedy lead-based paint hazards.

Tailor the services offered to the needs of the client.

Risk assessors and inspectors can reduce their liability exposure by doing a thorough job, by limiting the hazard identification to the date of the field visit in the report, and by using and citing recognized state-of-the-art procedures.

SECTION 3

PRELIMINARY CONTACT WITH THE DWELLING OWNER

Learning Objectives

After completing this section, students should be able to

- describe at least four important objectives of the initial property owner contact prior to conducting risk assessment services;
- describe five evaluation options that can be offered by the risk assessor to the property owner;
- name six motivating factors that may influence which evaluation option is most appropriate for a particular dwelling or set of dwellings;
- distinguish at least five differences between risk assessments and paint inspections;
- describe the purpose, advantages, and disadvantages of a lead hazard screen over a full risk assessment;
- identify the three major differences between an EBL investigation and a risk assessment;
- describe at least two recommended actions a risk assessor should take when a lead-poisoned child resides in a dwelling subject to the risk assessment services;
- summarize the preliminary data to be collected prior to conducting a risk assessment;
- list at least five key items to review with the owner prior to beginning a risk assessment.

Preliminary Contact with the Dwelling Owner

Purpose

The risk assessor's first contact with an owner of a property will usually involve a telephone call from the owner to the risk assessor. Because most people's knowledge of lead hazards remains limited, this conversation will not be as simple as when an owner wants a regular building inspection. Often, an owner will not know what is needed to solve lead problems. The risk assessor should provide information to the owner about lead hazards and how they can be evaluated. Perhaps, a risk assessment is not appropriate. Instead, the owner may need a lead inspection or a contact at the local health department. Whatever the owner's needs, a risk assessor should take the time to help the owner decide what is the best course of action for the owner's particular situation.

Once the owner and the risk assessor agree that a risk assessment is the best evaluation method to use, the risk assessor will begin gathering information needed to help conduct the risk assessment. Information about the use patterns of the home by the residents of the dwelling unit, especially children, will help the risk assessor decide where to direct the focus of the evaluation. For example, if the children in the unit never go into the basement and spend most of their time in the kitchen, it makes sense to spend more time inspecting and sampling the kitchen than the basement. In multifamily dwellings, collecting information about the management and maintenance practices of the building owners will help the risk assessor decide where to sample and what hazard control methods may be effective if hazards are found. By collecting as much of this information as possible before arriving at the site, the risk inspector can use the time at the site more efficiently. See Chapter 3 of the HUD *Guidelines* for further information on planning.[1]

Before completing the initial discussion with the owner, the risk assessor should provide the owner with as much information as possible about what the risk assessment will entail and what the final product will be. The owner should understand issues such as the length of the on-site visit, when the initial report will be ready, and the possible outcomes of the assessment.

[1]National Center for Lead-Safe Housing, *Guidelines for the Evaluation and Control of Lead-based Paint Hazards in Housing*, 1994.

Initial Responsibility of the Risk Assessor: Informing Owners of Their Evaluation Options

In many cases, the risk assessor will be the first person to provide comprehensive information about how to evaluate and manage lead-based paint hazards to a property owner. The risk assessor has at least five evaluation options that can be presented to the property owner:

- combination risk assessment/inspection;
- full paint inspection;
- full risk assessment;
- lead hazard screen;
- investigation of a dwelling with a child who has an elevated blood lead level.

The primary factors that will influence the owner's decision are

- motivation for having a lead evaluation conducted;
- likelihood of discovering a hazard (based on dwelling condition);
- likely hazard control options (based on available funds, lifetime of the unit, etc.);
- financial resources;
- future plans for the building.

Motivating factors that may affect which evaluation options are provided are

- legal or insurance requirements;
- property disposition (sale or turnover);
- liability issues;
- preventive measures for children at risk;
- preventive measures prior to renovation or remodeling;
- response to a child with elevated blood lead levels.

In some cases, the property owner will have a limited choice of the evaluation options available. Certain laws, regulations, or underwriting requirements may direct an owner to conduct an inspection or a risk assessment. When a resident child has an elevated blood lead level, the risk assessor should strongly encourage the child's guardians to have an EBL investigation conducted.

Difference between Inspection and Risk Assessment

The following table excerpted from the HUD *Guidelines* (Table 5.2) provides a comparison of risk assessments and paint inspections.

Comparison of Risk Assessment and Paint Inspection

Analysis, Content or Use	Risk Assessment	Paint Inspections
Paint	Deteriorated paint only	Surface-by-surface
Dust	Yes	Optional
Soil	Yes*	Optional
Water	Optional	Optional
Air	No	No
Maintenance status	Optional	No
Management plan	Optional	No
Status of any current child lead poisoning cases	If information is available	If information is available
Review of previous paint testing	Yes	Yes
Typical applications	1. Interim controls 2. Building nearing the end of expected life 3. Sale of property/turnover 4. Insurance (documentation of lead-safe status	1. Abatement 2. Renovation work 3. Weatherization 4. Sale or property/ turnover 5. Remodeling/repainting
Final report	Lead hazard control plan or certification of lead-based paint compliance	Lead concentrations for each surface tested

* If local experience indicates that soil lead levels are all very low, repeated soil sampling is not necessary.

Local definitions of inspection and risk assessment may vary.

Inspections are also appropriate when extensive renovation that is about to occur will disturb painted surfaces.

Difference between Inspection and Risk Assessment

Inspections	Risk assessments
• measure the concentration of lead in paint on a surface-by-surface basis	• measure the level of lead in dust, soil, and deteriorated paint
• identify the presence of lead-based paint on all components	• identify the location and nature of all lead-based paint hazards (primary prevention)
• allow the owner to avoid treating paint that is not lead-based	• consider information about past maintenance and management practices
	• allow the owner to treat all lead hazards present

Lead Hazard Screen

An alternative for owners of properties in good condition is the lead hazard screen. When an owner calls with a property that is in good condition, the risk assessor may suggest that the screen will be the more cost-effective evaluation tool to use. The risk assessor must point out, however, that if the unit fails the lead hazard screen (e.g., potential hazards are identified), the recommended course of action is the risk assessor's returning to the unit and conducting a full risk assessment. Therefore, an owner should be reasonably certain that the dwelling does not have lead-based paint hazards. For those dwellings that do, paying for a screen and a risk assessment is obviously not cost effective. The risk assessor determines the condition of a property using a standard form from the HUD *Guidelines* (see Chapter 9).

Difference between Risk Assessment and EBL Child Investigation

Risk assessments determine the presence of lead-based paint hazards, regardless of whether or not children are actually present or whether or not they have elevated blood lead (EBL) levels. The Centers for Disease Control and Prevention (CDC) defines an EBL requiring an environmental investigation as a blood lead level of 20 μg/dL or persistent readings above 15 μg/dL. The level of concern is 10 μg/dl. Sources of household lead that may be the cause of lead poisoning, such as lead in pottery, home remedies, and cosmetics, are not examined during a basic residential risk assessment.

A risk assessment is not appropriate when a child in the dwelling has been identified as having an EBL. When an EBL child resides in the dwelling, the risk assessor should urge the family to have an EBL investigation (not a risk assessment) conducted.

An EBL investigation

- is commonly administered by a local public health agency or childhood lead poisoning prevention program;
- combines medical and environmental follow-up for individual lead-poisoned children;
- may be supported by private risk assessors/inspectors (private risk assessors can conduct such investigations if approved by local health authorities).

An EBL investigation differs from a basic risk assessment in purpose, scope, and consequences. These differences are outlined on the next page.

Difference between Risk Assessment and EBL Investigation

Basic differences between Risk Assessments and EBL investigations

	Risk Assessment:	EBL Investigation:
Purpose:	Attempts to uncover only housing-related lead-based paint hazards by surveying likely sources	Attempts to identify a cause or causes for the lead poisoning of the child
Scope:	Focuses on the likely lead hazards at the property that the client owns or resides in	Focuses on all sources of lead in the child's environment. These sources include: • relatively uncommon sources of lead (such as glazed pottery) • other dwellings that the child visits
Consequences:	The property owner has almost sole authority to make decisions about lead hazard control options	Local public agencies may order hazard controls based on local laws. When a parent or property owner calls requesting information about an evaluation of a home with a lead-poisoned child, a risk assessor should consult with the local public health agency. In many cases, the local public health agency will have its own staff conduct the EBL investigation. If, after consultation with the local public health agency, the agency recommends that the risk assessor proceed, the protocols discussed later should be used.

Information to be Reviewed Before the Risk Assessment

Procedures to be Undertaken

The risk assessor should describe to the owner the data that will be collected during the risk assessment, the steps involved, and how the information will be used.

In Section 1, the seven risk assessment steps were identified.

Risk Assessment Steps

Step 1. Determine whether a risk assessment, inspection, a combination risk assessment/inspection, lead hazard screen, or EBL child investigation makes the most sense.

Step 2. Get background information on the dwelling; owner's plans and resources; and occupants (if present).

Step 3. Arrange a date to do the visual examination and environmental sampling.

Step 4. Conduct environmental sampling and send samples to an EPA-recognized laboratory.

Step 5. Combine visual findings with environmental sampling results and determine if hazards are present.

Step 6. Provide owner with a range of options to control any hazards found, along with roughly estimated costs and reevaluation schedules.

Step 7. Document all findings and determinations in a standard report.

Final Product

The risk assessor should explain to the owner what the final product will look like. The owner should understand that if lead-based paint hazards are found, the report will include control options for the owner to consider. The assessor and the owner should agree upon how much detail and information will be provided about the hazard control options.

The risk assessor should also explain to the owner the interaction that will occur between the risk assessor and any contractors that may become involved. Because the risk assessor should remain independent from the lead hazard control contractor, the owner should not expect to come to the risk assessor for one-stop shopping. The risk assessor should provide the owner with information about how to select a contractor but should not be involved in the actual selection process. If the owner decides to hire a risk assessor to consult with the owner and the contractor during the work, this can work as long as the risk assessor remains an independent party.

Risk assessors should not perform lead hazard control work and lead-based paint risk assessment in the same property.

Timing

One of the more difficult parts of the risk assessment is coordinating schedules with residents who are living in the units being assessed. Whether the risk assessor is working with an owner occupant or a landlord who will be notifying tenants about the assessment, the risk assessor should be very clear about the time that the visual assessment and sampling will take (45 minutes to 3 hours). However, the risk assessor should avoid discussion of dust sampling, which could lead to a special cleaning that would not characterize normal living conditions. If questioned, a risk assessor could state that "testing" will be done. Because the residents' cooperation often helps the risk assessor arrive at accurate conclusions, a risk assessor should always strive for good occupant relations.

The owner should also be aware of the constraints that the risk assessor has in completing the assessment. The owner must recognize that dust sampling will be critical to the final report and that these results may not be available for a week. Quicker turnaround of results can be requested from the lab, but in most cases the lab charges a higher price for this service. Owners should be told up front whether an interim report will be provided after the initial evaluation of the house or whether information will only be provided after all sampling data are available and analyzed.

Beyond providing the owner with the information about how long the evaluation will last, the owner and risk assessor (and possibly the residents) must decide on a mutually agreeable time to conduct the site visit. Because the travel time is often a significant expense, all parties should be well informed about when the assessment will occur and how access to units will be achieved so that the risk assessor is not forced to return to the unit. This is especially true for multifamily units where cost savings can be achieved by the risk assessor's gaining access to the worst-case units instead of randomly selected units. (Further information about this can be found in the section on multifamily housing.) Further guidance about planning and building access is found in the HUD *Guidelines*, Chapter 3.2.

Information to be Reviewed Before the Risk Assessment

Information to be Reviewed Before the Risk Assessment

Providing Information to Tenants in Rental Housing

The role of the risk assessor as educator can become complicated in some situations. While the people who are in the most need of information are the tenants, the client of the risk assessor is the property owner. Some owners may be concerned that by advising residents about lead poisoning, their risk of exposure to lawsuits may rise. Even so, risk assessors should encourage owners to allow the tenants access to information about lead poisoning. By learning more about lead-safe practices, residents are quite likely to take precautions and reduce their exposure to lead hazards. In the end, providing the information may be beneficial to all parties. The risk assessor should not, however, distribute educational materials or otherwise advise tenants about lead hazards unless the risk assessor has the owner's permission to do so. (See Section 14 of this course notebook regarding occupant relations.)

Preliminary Data Collection to Assist the Risk Assessment

The risk assessor should collect preliminary data about the dwelling unit and the use of the unit prior to conducting the risk assessment. Preliminary information from the owner can be recorded on either one of the following two forms from the HUD *Guidelines*, depending on whether or not the property is a single-family or multifamily property.

The information provided will help the risk assessor anticipate areas where hazards are likely to exist. The information can also point to areas where work should be prioritized, such as rooms or outdoor areas where children frequently play. The information about larger rental properties can help the assessor determine the most appropriate units to evaluate. The information can also help the risk assessor recommend changes to the operations and maintenance procedures at the property so that potential lead hazards are routinely monitored and managed.

Management Data or Risk Assessment of Lead-based Paint Hazards in Rental Dwellings (Optional)

NOTE: This form is designed for multiple rental dwellings under one ownership. Such dwellings may be in one property or many.

Part 1: Identifying information

Name of property owner ______________________________

Name of building or development (if applicable) ______________________

Number of dwelling units________

Number of buildings______

Number of individual dwelling units/building ____

Date of construction (if one property) ________

Date of substantial rehab, if any, and list of components replaced since 1978 ________________

____

List of addresses of dwellings (attach list if more than 10 dwellings are present)

Street address, city, state	Dwelling unit no.	Year built	Number of children aged 0-6 years old	Recent code violation reported by owner?	Chronic maintenance problem reported by owner?

Record number and locations of common child play areas (on-site playground, backyards, etc.)

Number ___

________________ ________________ ________________

________________ ________________ ________________

________________ ________________ ________________

Part 2: Management/Information

1. List names of individuals who have responsibility for lead-based paint. Include owner, property manager (if applicable), maintenance supervisor and staff (if applicable), and others. Include any training in lead hazard control work (inspector, supervisor, worker, etc.) that has been completed. Use additional pages, if necessary.

   This information will be needed to devise the risk management plan contained in the risk assessor's report.

Name	Position	Training completed (if none, enter "None")
	Owner	
	Property manager	
	Maintenance	

2. Have there been previous lead-based paint evaluations?

   ______ Yes ______ No (If yes, attach the report.)

3. Has there been previous lead hazard control activity?

   ______ Yes ______ No (If yes, attach the report.)

4. Maintenance usually conducted at time of dwelling turnover, including typical cleaning, repainting, and repair activity.

   Repainting: ______________________

   Cleaning: ______________________

   Repair: ______________________

   Other: ______________________

   Comments: ______________________

5. Employee and worker safety plan

   a. Is there an occupational safety-and-health plan for maintenance workers? (If yes, attach plan.) ______ Yes ______ No

   b. Are workers trained in lead hazard recognition? ______ Yes ______ No
   If yes, who performed the training? ______________________

c. Are workers involved in a hazard communication program? ______ Yes ______ No

d. Are workers trained in proper use of respirators? ______ Yes ______ No

e. Is there a medical surveillance program? ______ Yes ______ No

6. Is a HEPA vacuum available? ______ Yes ______ No

7. Are there any on-site licensed or unlicensed day-care facilities? ______ Yes ______ No
   If yes, give location. ______________________________

8. Planning for resident children with elevated blood lead levels.

   a. Who would respond for the owner if a resident child with elevated blood lead level is identified? ______________________________

   b. Is there a plan to relocate such children? ______ Yes ______ No

      If yes, where? ______________________________

   c. Do you (the owner) know if there ever has been a resident child with an elevated blood lead level? _____ Yes _____ No _____Unknown

9. Owner Inspections

   a. Are there periodic inspections of all dwellings by the owner? If yes, how often? ______ Yes ______ No ______________________________

   b. Is paint condition assessed during these inspections? ______ Yes ______ No

10. Have any of the dwellings ever received a housing code violation notice? _____ Yes _____ No _____Unknown

    If yes, describe code violation____

11. If previously detected, unabated lead-based paint exists in the dwelling, have the residents been informed? ______ Yes ______ No ______Not Applicable

Key Concepts

Before beginning the risk assessment, the risk assessor should

- provide information to the owner about lead hazards and how they can be evaluated;
- help the owner decide what is the best course of action for the owner's particular situation;
- begin gathering information needed to help conduct the risk assessment;
- collect information about the management and maintenance practices of owners of multifamily properties;
- provide the owner with as much information as possible about the risk assessment and what the final product will be.

Evaluation Options

The risk assessor has at least five different evaluation options that can be recommended to the property owner:

- combination risk assessment/inspection;
- full paint inspection;
- full risk assessment;
- lead hazard screen;
- investigation of a dwelling with a child who has an elevated blood lead level.

The risk assessor has a responsibility to identify the most appropriate strategies for a specific property.

There are at least six motivating factors that the risk assessor should review with the owner that may affect which evaluation options are provided:

- legal or insurance requirements;
- property disposition (sale or turnover);
- liability issues;
- preventive measures for children at risk;
- preventive measures prior to renovation or remodeling;
- response to a child with elevated blood lead levels.

Key Concepts

Risk assessments and paint inspections differ with respect to the analysis, maintenance, management, typical applications, and contents of the final report.

A lead hazard screen is a limited set of risk assessment procedures that may act to exempt a dwelling unit from the full risk assessment requirements.

The risk assessor should consult with the local public health agency about an evaluation of a home with a lead-poisoned child. When an EBL child resides in the dwelling, the risk assessor should urge the family to have an EBL investigation conducted.

The risk assessor should review all information with the owner.

SECTION 4

Visual Examination

continued

Learning Objectives

After completing this section, students should be able to

- describe at least five areas that risk assessors should examine during the visual examination;
- identify the five major steps performed by the risk assessor to determine whether a unit has lead-based paint hazards;
- identify at least four questions that the risk assessor should consider during the initial building walk-through;
- identify under what circumstances hazard control options for lead that require frequent owner monitoring and repair may be inappropriate;
- describe a standardized approach for quantifying building component paint conditions;
- determine when paint chip sampling or XRF testing is appropriate;
- describe what helps to identify the most appropriate hazard control strategy and necessary preliminary corrections;
- list at least five categories of paint deterioration;
- name at least six areas to include in the exterior visual examination;
- summarize what to look for during the exterior visual examination;
- name at least eight areas to include in the interior visual examination;
- summarize what to look for during the interior visual examination.

Purpose and Goals of a Visual Examination

The purpose of the visual examination is to look at the exterior and interior of a dwelling unit to identify potential lead-based paint hazards and their causes. The following checklist summarizes the areas of the dwelling unit that should be examined.

Visual Examination Checklist—What to Look For

- deteriorated paint and visible causes of such deterioration (e.g., moisture and structural problems)
- visible dust accumulation (see Section 5)
- bare residential soil (see Section 6)
- painted surfaces that are either impact points (e.g., doors and baseboards) or subject to friction (e.g., windows)
- painted surfaces that a child is suspected of chewing

Because lead cannot be seen, assessors will not be able to use the results of the visual examination to determine conclusively whether lead-based paint hazards exist or not. The visual examination can only locate areas where paint, dust, and/or soil may be hazards if they contain lead above applicable limits. By combining the results of the visual examination with the analysis from the environmental sampling, the risk assessor can determine if lead-based paint hazards are present and where they are located. Use of visual evidence to determine sampling locations is covered elsewhere in this manual.

The primary role of the risk assessor does not include identifying building code violations or other structural problems when these problems will not have an immediate impact on lead-based paint. For example, if a roof is not visible from the ground level, a risk assessor should not take the time to gain access to the roof to check for potential weathering and water damage. If a roof leak is creating a hazard, such as peeling paint, the assessor will be able to see the paint deterioration during the interior examination. However, a risk assessor may need to determine whether or not code violations have existed in the past by conducting interviews or reviewing records. The risk assessor typically gathers this information to select those dwelling units in multi-family housing developments that will require further investigation.

Visual Examination Steps

Purpose and Goals of a Visual Examination

During a visual examination, the risk assessor should:

- conduct initial building walk-through;
- assess paint condition by classifying surfaces into intact, fair, and poor categories;
- identify exterior problems that can lead to paint deterioration;
- identify areas of bare soil;
- identify interior problems that can lead to paint deterioration.

Initial Building Walk-through Survey

As the risk assessor begins the visual examination, it is helpful to get a quick impression of the exterior and interior condition of the building. The assessor should use this building walk-through to gain a sense of the overall condition of the unit. During such a walk-through, the assessor should ask the following:

- Is this house/apartment in generally good repair, or are there significant structural or moisture problems (e.g., big cracks in walls, sagging walls, holes in the roof, and extensive water stains)?
- Are there large amounts of deteriorated paint and/or visible dust accumulation?
- Are the windows and doors old and possibly coated with lead-based paint? Or, are the windows and/or doors relatively new and hence unlikely to be coated with lead-based paint? Are the tracks generally painted and/or do the troughs contain chips and dust?
- Is there any obvious, exterior source of lead (e.g., an old house next door that has lots of peeling paint or a battery recycling shop that is located nearby)?

This type of information will help the risk assessor in targeting the more thorough examination and giving the property owner a quick sense of the time needed to evaluate the unit.

The initial survey will also provide the risk assessor with an understanding of the property's recent maintenance history. If the property obviously has been poorly maintained (e.g., with broken windows or unfixed water leaks), it is a good indicator that the owner is unlikely to be diligent about controlling lead-based paint hazards in the future unless a new management program is adopted. In these situations, interim controls, and other measures that require frequent monitoring and repair by the owner are less likely to be successful. The form entitled "Building and Soil Condition," can be used by the assessor to evaluate building condition.

Assessing Paint Condition

Following the initial survey of the property, the risk assessor should examine painted surfaces both inside and outside to locate painted surfaces that show deterioration, friction points, impact points, or evidence of chewing/mouthing. By combining the evaluation of the paint condition with previous or subsequent tests of the lead content of the paint, the risk assessor is able to determine where lead-based paint hazards exist. Of course, if paint on certain components is known not to contain lead above the regulatory limit, it is not necessary to evaluate its condition.

When assessors look at painted surfaces, they should ask two key questions: (1) what is the extent of deterioration (how large an area is deteriorated)?; and (2) what type of deterioration is occurring?

The following table presents the HUD *Guidelines* criteria for rating the extent of deterioration as "intact," "fair," or "poor." Surfaces in poor condition require lead hazard controls; fair surfaces should be monitored frequently (or repaired); and intact surfaces should merely be monitored. Any surfaces in "poor" or "fair" condition are candidates for paint chip sampling or limited XRF testing. Surfaces judged to be "intact" do not need to be tested.

Assessing Paint Condition

HUD *Guidelines* Table 5.4
Categories of Paint Film Quality

	Total area of deteriorated paint on each component		
Type of building component[1]	Intact	Fair[2]	Poor[3]
Exterior components with large surface areas	Entire surface is intact	Less than or equal to 10 ft^2	More than 10 ft^2
Interior components with large surface areas (walls, ceilings, floors, doors)	Entire surface is intact	Less than or equal to 2 ft^2	More than 2 ft^2
Interior and exterior components with small surface areas (window sills, baseboards, soffits, trim)	Entire surface is intact	Less than or equal to 10% of the total surface area of the component	More than 10% of the total surface area of the component

1 "Building component" in this table refers to each individual component or side of building, **not** the combined surface area of all similar components in a room (e.g., a wall with one ft^2 of deteriorated paint is in "fair" condition, even if the other 3 walls in a room have no deteriorated paint).

2 Surfaces in "fair" condition should be repaired and/or monitored, but are not considered to be "lead-based paint hazards" as defined in Title X.

3 Surfaces in "poor" condition are considered to be "lead-based paint hazards" as defined in Title X and should be addressed through abatement or interim controls.

The paint condition should be recorded on the form entitled "Paint Conditions on Selected Surfaces" from the HUD *Guidelines*.

The next step is for the assessor to figure out what type of deterioration is occurring in order to be able to identify hazard control options. Assessors should decide which of the five categories of paint deterioration listed below is present. Section 11 on developing hazard control plans uses the same categories when discussing alternative control methods.

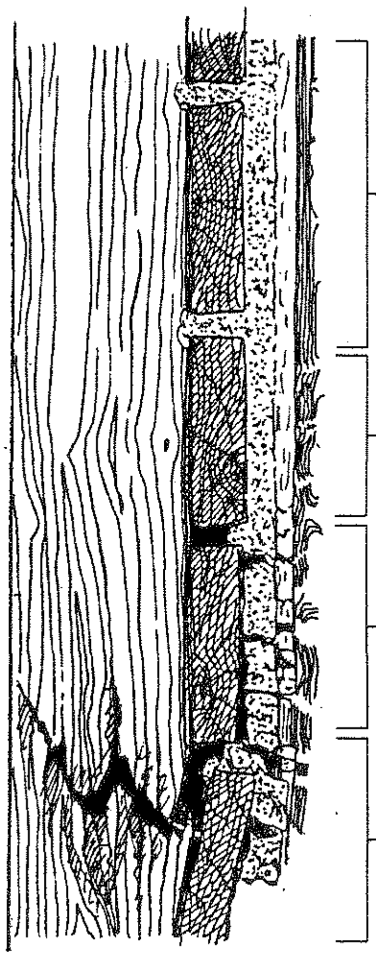
Five Categories of Paint Deterioration

Paint failures fall into five categories:

- surface-coat failure—top layer of paint is flaking, peeling, or otherwise detaching from layers below;
- multi-coat failure—several of the top layers of paint or other coatings (e.g., wallpaper) are delaminating from layers below;
- paint failure revealing unsound substrate or structure—paint delamination reveals the substrate or underlying structure is unsound (e.g., rotted wood, plaster off lathe);
- paint abrasion—paint is rubbing because of mechanical friction (e.g., windows) or from human contact (e.g., painted stairs and floors scuffed by walking or other contact);
- chipped paint—pieces of paint are loosened or broken because of impact (e.g., doors, baseboards, chair rails).

Each of these categories of paint failure is depicted in a drawing, and the potential causes of such failure are discussed in the following table.

Table 4-1
Paint Failure Conditions and Causes

<table>
<tr><th>Illustrations</th><th>Condition</th><th>Cause</th></tr>
<tr><td rowspan="6">
</td><td>top layer deterioration</td><td>poor surface preparation; incompatible paint such as enamel over latex; natural chalking of paint</td></tr>
<tr><td>paint abrasion</td><td>mechanical friction of windows, doors; foot traffic on floors/stair treads</td></tr>
<tr><td>chipped paint</td><td>mechanical impact of doors, windows; impact of furniture on baseboards and other molding; physical impact</td></tr>
<tr><td>multiple layer deterioration</td><td>heavy paint build-up; moisture/mildew damage; multiple layers on wallpaper</td></tr>
<tr><td>substrate damage</td><td>moisture/water damage; structural movement; termites or other pests; physical damage</td></tr>
<tr><td>structural damage</td><td>moisture/water damage; structural movement; termites or other pests; physical damage</td></tr>
</table>

Form 5.2
Paint Conditions on Selected Surfaces
(Single-Family, Owner-Occupied)

Building component	Location Notes	Paint condition (intact, fair, poor, or not present) to be completed by risk assessor	Deterioration due to friction or impact?	Deterioration due to moisture?	Location of painted component with visible bite marks
Building siding					
Exterior trim					
Exterior windows					
Exterior doors					
Railings					
Porch floors					
Other porch surfaces					
Interior doors					
Ceilings					
Walls					
Interior windows					
Interior floors					
Interior trim					
Stairways					
Radiator (or radiator cover)					
Kitchen cabinets					
Bathroom cabinets					
Other surfaces:					

If the overall condition of a component is similar throughout a dwelling, that condition should be recorded. If a component in a couple of locations is in poor condition, but the overall condition is good or fair, the specific sites of the badly deteriorated paint should be noted. The specific locations of any component with bite marks should be recorded.

Exterior Examination

On the exterior of a unit, assessors should begin at the top of the building and move to the bottom. This approach will help assessors avoid overlooking areas. It will also help them trace any water problems to deteriorated surfaces below and provide important information on water damage early in the process. During the examination, assessors should note any deteriorated paint and the extent of such deterioration on the form "Paint Conditions on Selected Surfaces" and use this information to help complete the "Building and Soil Condition Form."

The following drawing identifies common locations or situations where water and structural problems can contribute to lead-based paint hazards. More information on moisture and structural problems and how to repair them is provided later in this section and in Section 11.

Roof, Gutters, and Downspouts

From the ground, the assessor should look for signs of deterioration of the roof surface, which may result in water problems. If the roof is not visible from the ground, the assessor should examine the top interior ceiling for signs of water damage. The assessor should make sure that gutters and downspouts are not broken or missing. An improper flow of water can damage walls and roofs and seep inside the house. The assessor should also check the mortar and flashing surrounding the chimney, if visible, to make sure that water is not seeping into the house. A pair of binoculars may help. The assessor should note any exterior water problems in these areas and be sure to check the interior walls, ceilings, and other areas that could be damaged because of these exterior water problems.

Windows

From the outside of the building, an assessor should look for broken windows; areas where the caulking or sizing is missing; or areas where water is settling between the sash and the window screen. Risk assessors need not use this procedure on all windows but should determine whether this problem is common inside the dwelling. Section 11 on developing hazard control plans provides a detailed discussion on common window problems and appropriate repairs.

Porches

Painted porches should be examined for signs of structural decay and paint deterioration. The risk assessor also should record places where water may be settling on painted porch floors since this problem also is likely to result in paint failure.

Exterior Examination

Masonry and Foundations

Cracks in the foundation or eroded mortar joints on a brick structure are points where moisture can infiltrate the building. Larger cracks in the foundation may indicate structural problems that could cause interior plaster walls to shift above the cracks. Assessors should note such exterior cracks and check inside to see if corresponding paint deterioration is occurring. If the structural problems appear to be severe, what may appear to be paint deterioration could be the result of substrate cracking. If this is the case, any repainting of the shifting surfaces soon may crack and reexpose the hazard.

Other Painted Surfaces (Fences, Garages)

Risk assessors should check the paint condition of these structures and soil around them for paint chips to determine if any paint is deteriorating. The risk assessor should look for signs of children's play areas around these structures.

Bare Residential Soil

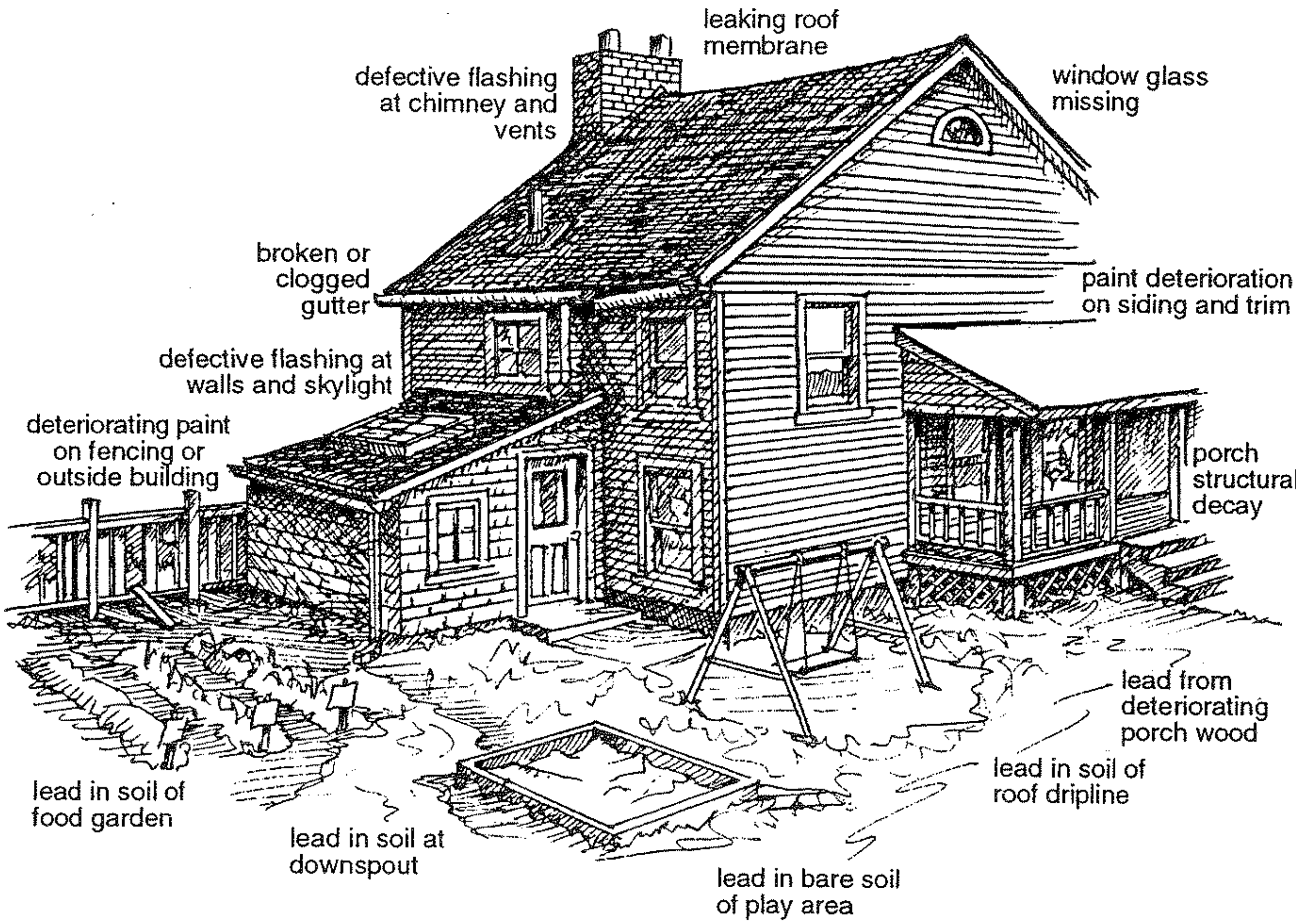
Federal law clearly defines a lead-based paint hazard to include "bare residential soil" with dangerous levels of lead. The assessor should locate bare soil spots, paying particular attention to children's play areas where ground cover is often worn away and exposure to soil hazards is likely. Examples of such locations are as follows:

- the ground underneath swing sets or other play equipment;
- sandboxes;
- ground abutting patios or other key portions of the dwelling unit;
- foundation drip line;
- the ground under porches (frequent play areas);
- discharge from downspouts.

Bare spots should be noted, and the assessor should sample the soil in these areas. The assessor should also note if paint chips are present around the foundation for potential paint chip sampling. (See Section 6 on soil sampling and Section 7 on paint sampling.)

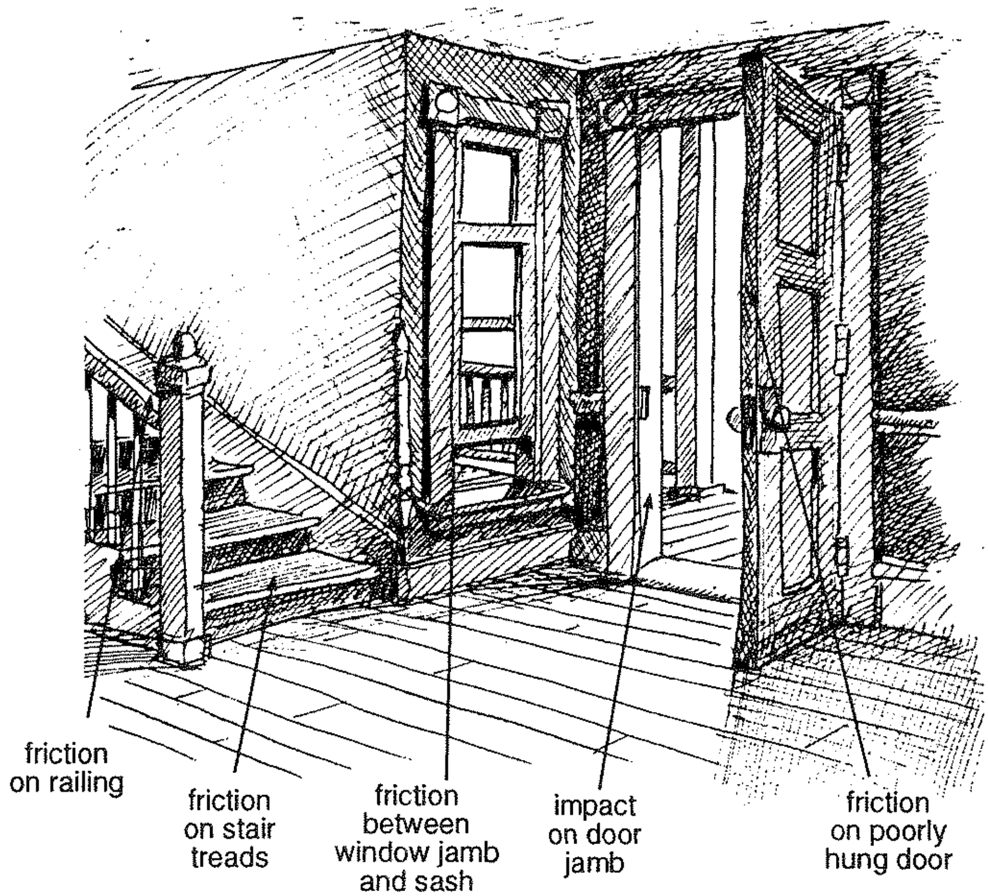
Exterior Examination

Frequent exterior areas of deteriorated paint and moisture problems



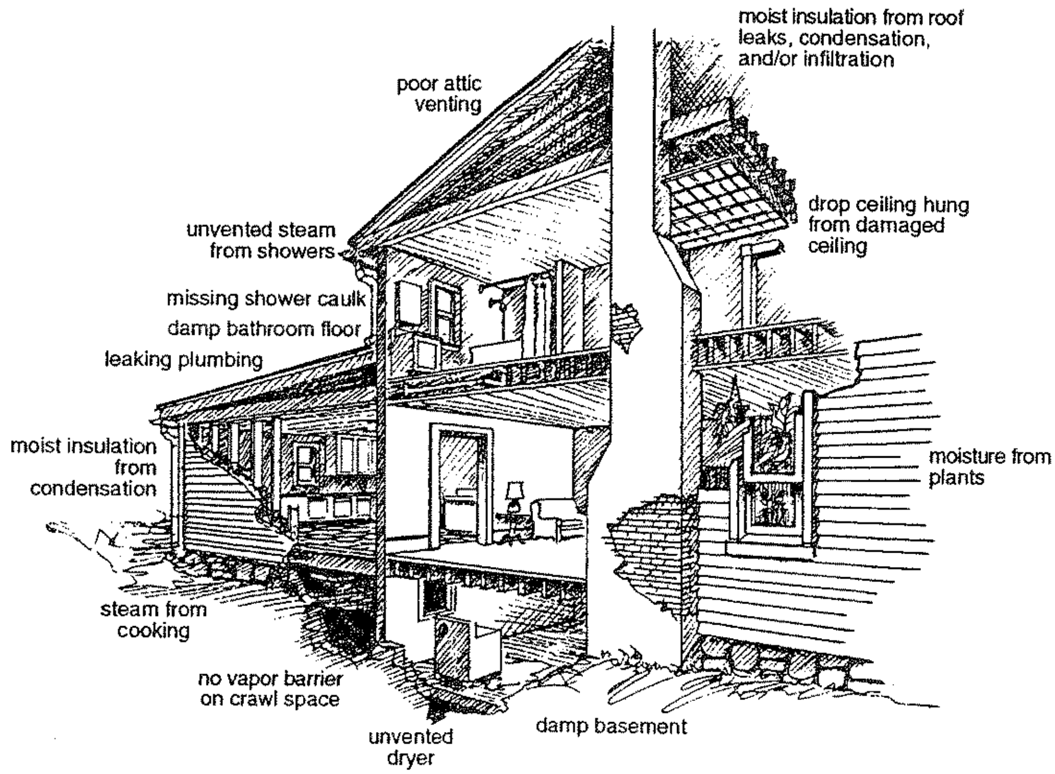
Interior Causes and Locations of Lead-based Paint Hazards

The following drawing identifies likely locations of deteriorated paint (from moisture or structural problems) and friction, impact, and chewable surfaces. Paint deterioration and building conditions should be recorded on the "Paint Condition on Selected Surfaces Form" and the "Building Condition Form." Refer to both forms after developing hazard control plan and risk assessment reports.



Interior Causes and Locations of Lead-based Paint Hazards

Frequent interior areas of paint deterioration and moisture problems



Attic

A risk assessor should only take the time to investigate the attic if it is a living space or if there is evidence of paint deterioration on the uppermost ceiling. It may be helpful to bring a small step stool to provide access to an attic and ceilings.

Drop Ceilings

The presence of drop ceilings may hide paint deterioration that is occurring on the ceilings above them. In a few selected rooms, a risk assessor should lift a ceiling panel to determine the condition of the ceiling, taking care not to release dust or paint chips into the living area. The rooms in which problems are most likely to be found are rooms under baths or kitchens or rooms where roof leaks are suspected.

Interior Causes and Locations of Lead-based Paint Hazards

Windows

Opening and shutting windows causes the paint on them to be susceptible to chipping and abrasion. Because abrasion can be a contributing factor to the high levels of lead-contaminated dust found on window sills and troughs, risk assessors should note during the initial walk-through where paint abrasion on windows is occurring. The risk assessor should have a general sense of window conditions and should use this knowledge in proceeding with the examination.

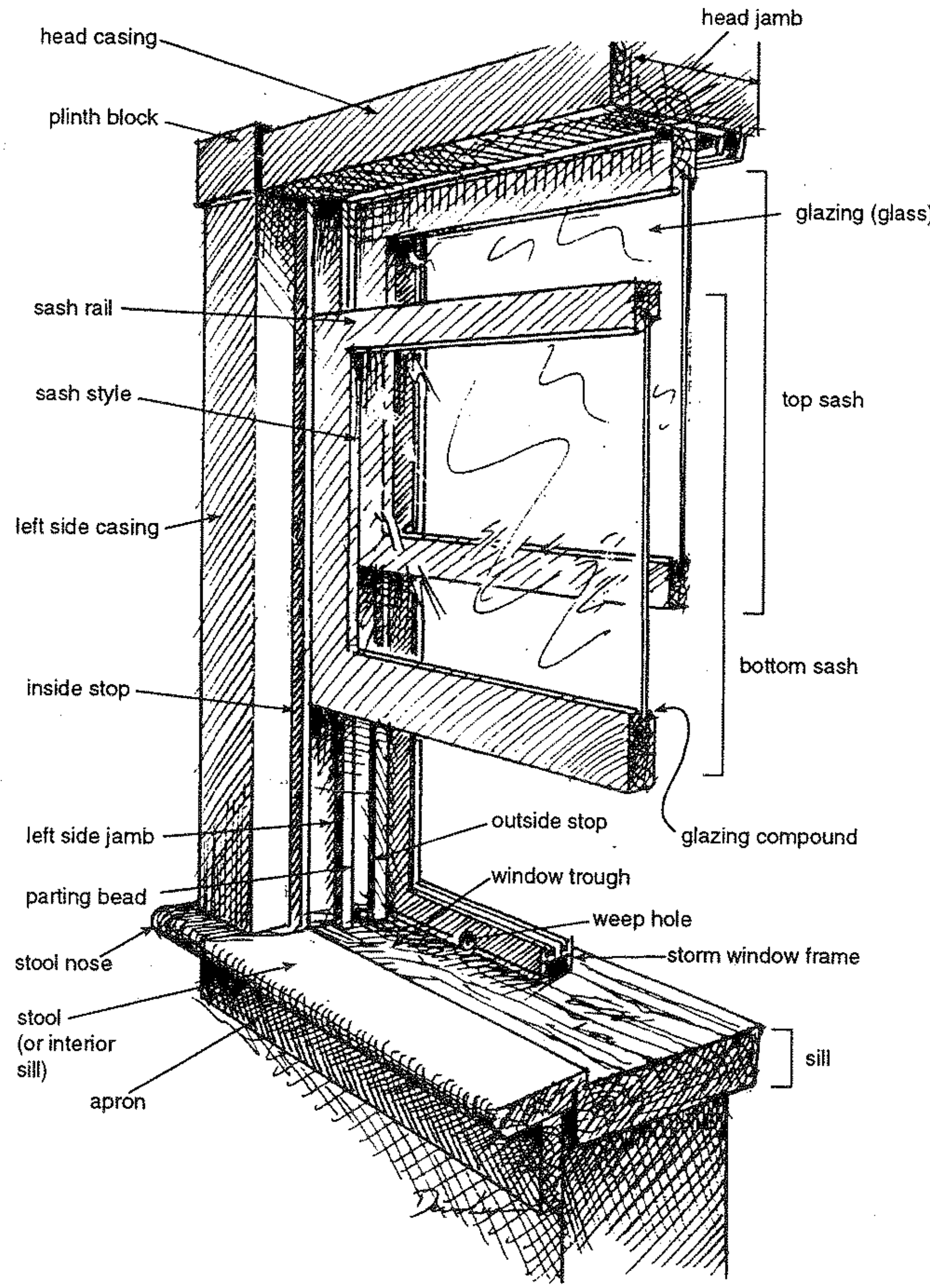
For dwelling units with newer windows (post-1978) or units where the window tracks have not been painted, the risk assessor does not need to check for abrasion. Likewise, the assessor does not need to check for chipping and abrasion in dwelling units where the windows are in poor condition (e.g., rotted windows, broken windows), because more significant work will be required. In older units where the windows are in fair to good condition, the risk assessor should conduct a more thorough review of the windows. For example, check to see if the tracks are painted and if abrasion of potential lead-based paint is occurring. Window troughs should be examined for visible dust and/or chips and impact points. This information should be noted on the "Paint Condition of Selected Surfaces Form."

If residents are present, the risk assessor should ask which windows are opened and closed and if any of the windows stick when they are opened or closed. When an assessor checks the windows, it is not necessary to operate all windows but rather to check a reasonable subset to find if the windows have potential lead problems. Windows in children's bedrooms and play areas are important for the risk assessor to examine because children spend the most time in these areas.

While reviewing the condition of the windows, assessors also should note whether there is evidence of mouthing or chewing on the window sill. Before it can be determined whether the windows pose lead hazards, the environmental samples will need to be collected and analyzed. Deteriorated paint should be sent to the laboratory for analysis and troughs and sills sampled for dust lead in areas where abrasion and impact of painted surfaces may be occurring. (See Section 5 for a discussion of dust sampling in windows troughs and sills and Section 7 on paint sampling.)

Interior Causes and Locations of Lead-based Paint Hazards

Window components

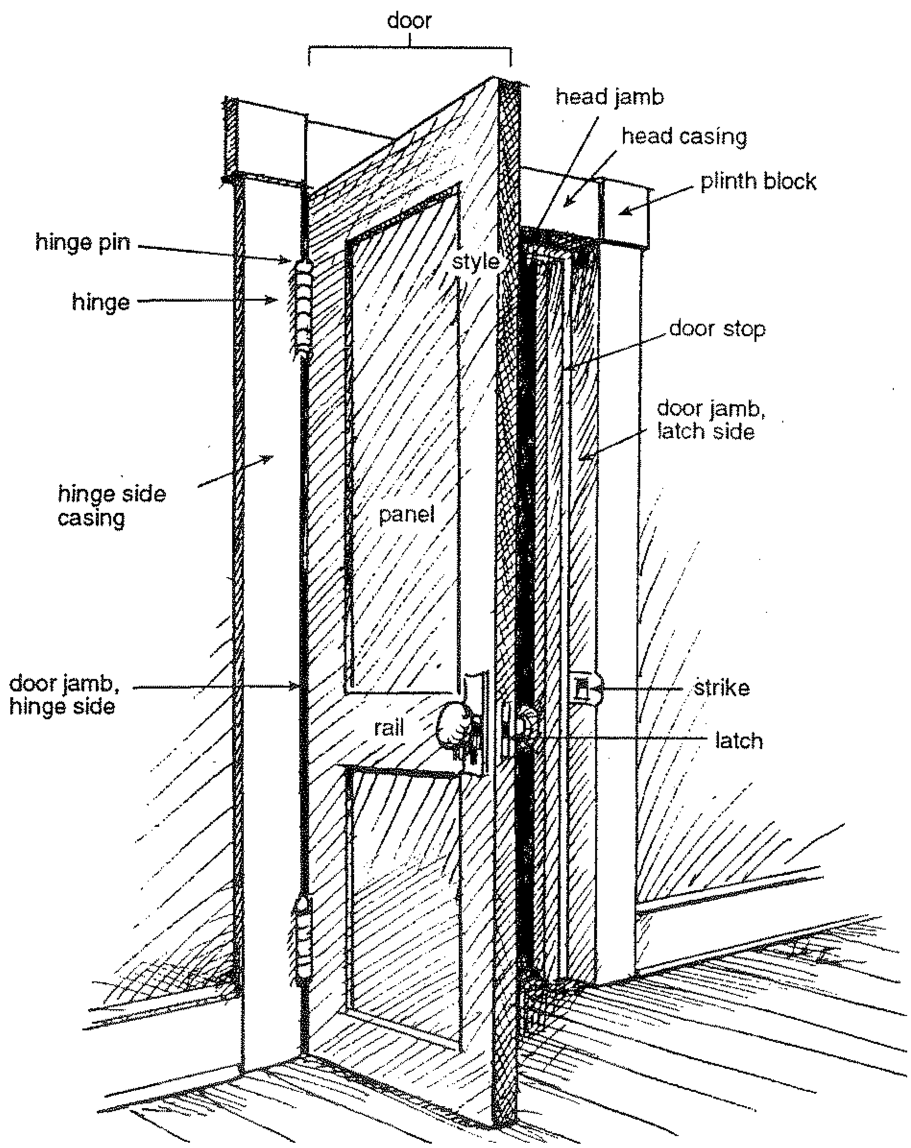


Doors

Like windows, the paint on doors and door casings is susceptible to chipping and abrasion. If the residents of the unit are present during the risk assessment, they should be asked which doors are used most frequently and if any of them stick (see information on "Resident Questionnaire"). For older painted doors where the paint is generally intact, the risk assessor should operate a few of them to see if chipping or abrasion is occurring. Look for signs of scraping where the door closes against the latch or head jamb or crushing near the hinges and jamb. Paint condition on the door itself should also be noted. Doors in children's bedrooms and play areas are particularly important to check because children spend the most time in these areas.

Interior Causes and Locations of Lead-based Paint Hazards

Door components

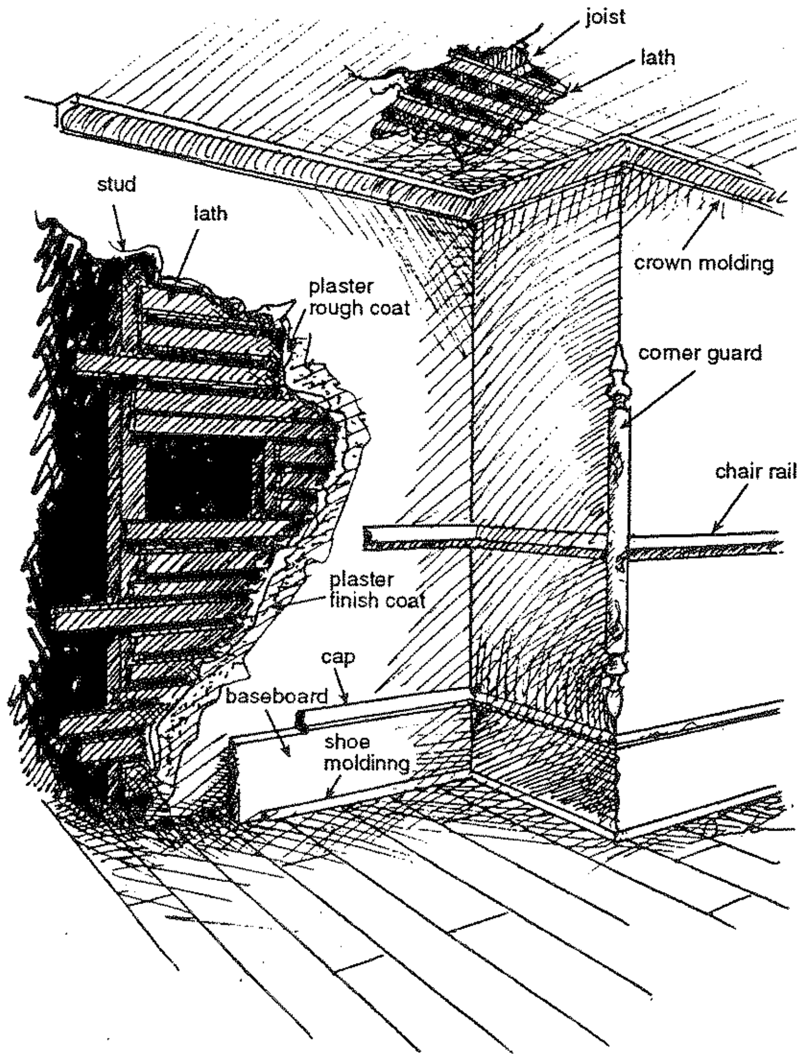


Interior Causes and Locations of Lead-based Paint Hazards

Baseboards and Molding

Assessors should look for signs of impact (e.g., chipping paint) on baseboards, chair rails, stair rails, and other pieces of trim and molding in the unit. Risk assessors also should note if teeth marks are present on any of the surfaces.

Wall/trim components



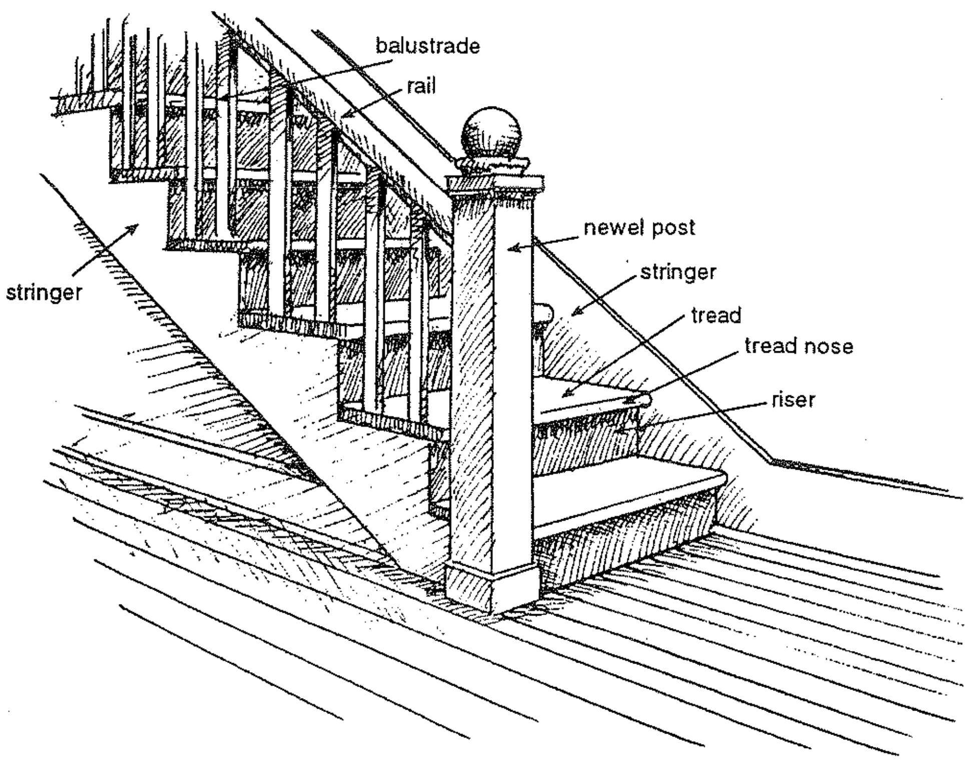
Stairs and Floors

Painted floors and stairways are potential friction points. Risk assessors should look for signs of wear and abrasion on stair treads, risers, floors, railings, and newel posts. (See Section 5 for a discussion of dust sampling on such surfaces and Section 7 on paint sampling.)

Assessors also should note whether the floors are in "cleanable" condition. Noncleanable surfaces are porous or cracked surfaces, where dust is likely to become trapped (e.g., wood floors that are not sealed and deteriorated vinyl or linoleum). Although noncleanable surfaces are not, by definition, lead-based paint hazards, they should be made cleanable if other lead hazards exist around them, such as lead-contaminated dust on floors or nearby deteriorated paint.

Interior Causes and Locations of Lead-based Paint Hazards

Stair components



Plumbing

The risk assessor should examine accessible plumbing fixtures to locate visible leaks. (Leaks from the faucet into the sink will not cause paint deterioration.) If the unit has hot water heating, the areas around the heating system also may be examined. In kitchens and baths where water condensation often occurs, the risk assessor should make sure that mildew is noted, since it can lead to paint failure.

Basement

As on the exterior, the foundation and mortar should be examined for cracks and water infiltration that can cause paint deterioration. Large cracks in painted surfaces caused by structural problems are important for the risk assessor to recognize since structural movement may have a significant impact on the hazard control options available.

Building Condition Form
(from HUD *Guidelines* Form 5.1)

Condition	Yes	No
Roof missing parts of surfaces (tiles, boards, shakes, etc.)		
Roof with holes or large cracks		
Gutters or downspouts broken or missing		
Chimney masonry cracked, bricks loose or missing, obviously out of plumb		
Exterior or interior walls with obvious large cracks or holes, requiring more than routine pointing (if masonry) or painting		
Exterior siding with missing boards or shingles		
Water stains on interior walls or ceilings		
Plaster walls or ceilings deteriorated		
Two or more windows or doors broken, missing, or boarded up		
Porch or steps with major elements broken, missing, or boarded up		
Foundation with major cracks, missing material, structure leans, or visibly unsound		
Total number*		

* If the "Yes" column has two or more checks, the dwelling is considered to be in poor condition. Fewer than two checks in the "Yes" column means that the dwelling appears to be well maintained and the Standard Reevaluation Schedule does not need to be revised. Only buildings in "good" condition are eligible for the Lead Hazard Screen.

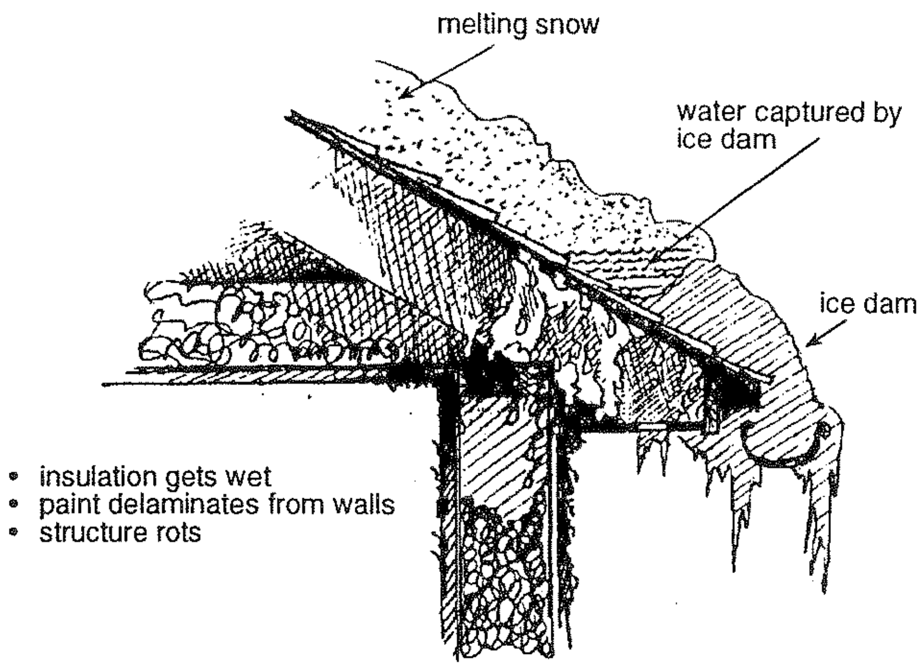
Notes:

Moisture Problems Outside the Dwelling

Roof Damage

Roof leaks frequently result in water problems. Examples include:

- **Missing or damaged shingles.** Recommended repair: Replace or patch.
- **Ice dam build up.** As a result of poor insulation and venting heat rises to roof, melts snow which freezes and causes ice dam. Recommended repair: Properly insulate and ventilate attic.



- **Low areas collecting water.** This typically occurs in row houses with "flat roofs" that have a sunken area. Recommended repair: Repair roof structure at low point.

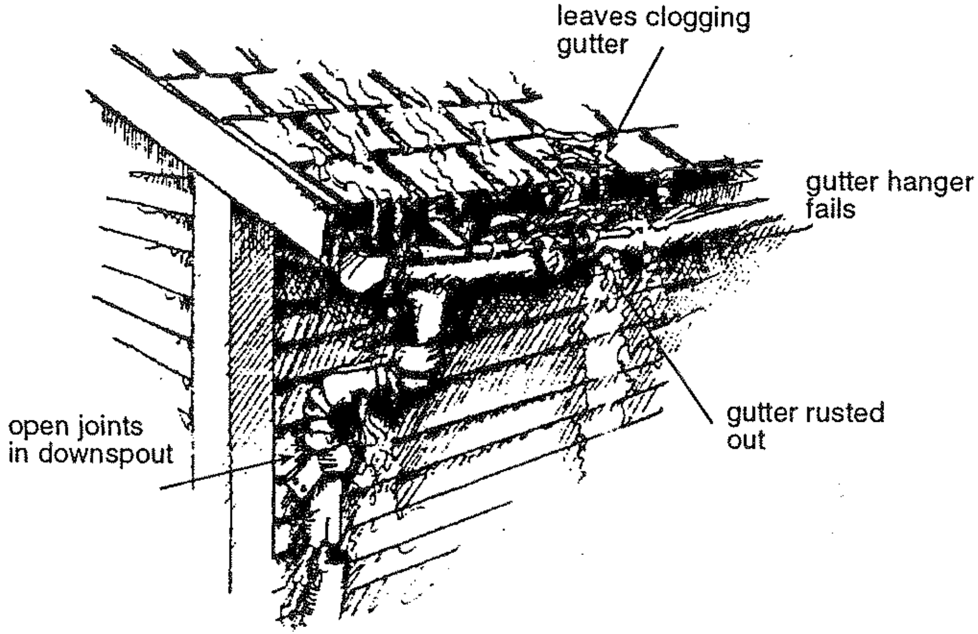
Failure of Gutters or Downspouts

Gutters or downspouts that fail to channel water away from the building should be repaired. Examples follow of common gutter/downspout failures with recommended repair actions.

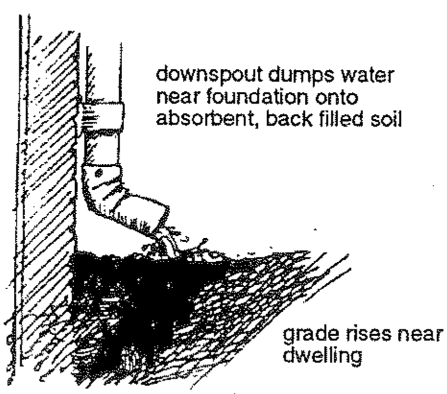
- **Clogged gutters or downspouts.** This can allow water to flow against and penetrate exterior walls. (Clogs can be discovered by directing water from a garden hose or dumping a bucket of water on accessible roof surfaces.) Recommended repair: Clean out gutters/downspouts and prevent future accumulation by installing protective screen.

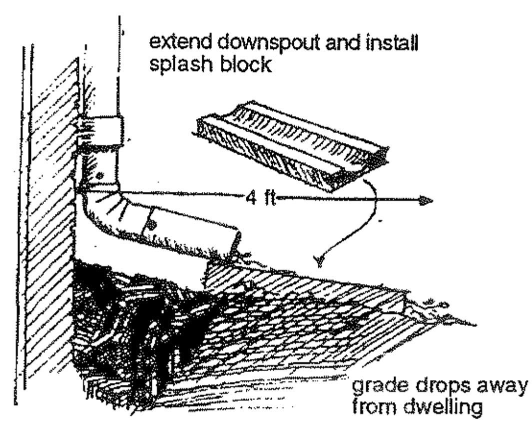
Moisture Problems Outside the Dwelling

- **Gutters and downspouts separate at joint.** Water is no longer directed away from the building and can penetrate exterior walls or flow too near the foundation. Recommended repair: Rejoin and fasten gutter to downspout.
- **Gutter and downspout rust out.** Recommended repair: Replace affected gutters and downspouts (small openings can be patched.)



- **Downspout dumps water too near foundation.** Recommended repair: Extend downspout out to a drain block to ensure water enters ground four feet or more from foundation.
- **Downspout dumps water on surface sloped toward foundation.** Recommend repair: Regrade or crate a runoff or drainage system to take water away from foundation.





Moisture Problems Outside the Dwelling

Ineffective Flashing

Improper flashing allows water to penetrate into the building. Examples include:

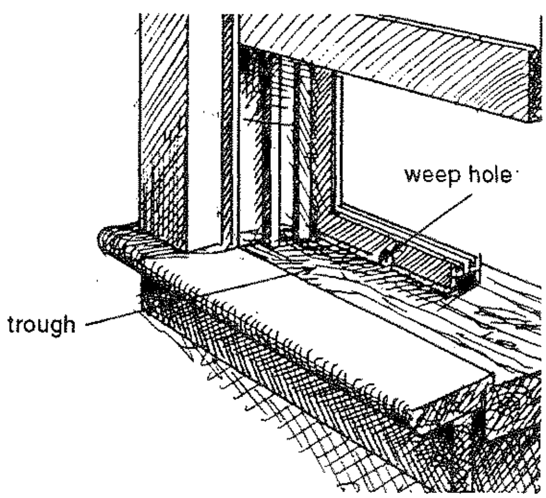
- flashing is delaminated from improper installation or water damage;
- flashing extends over the roofing on the upper part of the flashed object;
- no flashing exists above window or door;
- holes appear in flashing from rust, improper fastening, being stepped on.

Recommend repair: In all the above instances the flashing should be replaced before undertaking any lead hazard control measures.

Windows

Windows can be a significant source of moisture if the following problems exist.

- Damaged window
  - Poorly fitted window sash or damaged glazing (window and/or putty) can permit water to enter the building and should be repaired or replaced.
  - Storm window frame traps water in trough because no "weep holes" exist. Recommended repair: Open existing weep holes or drill new holes.



- Trough
- Single-glazed windows. Particularly when there is high humidity, condensation can occur. Recommended repair: Lower humidity, or if replacing windows use double glazing.

Moisture Problems Outside the Dwelling

Damaged Masonry

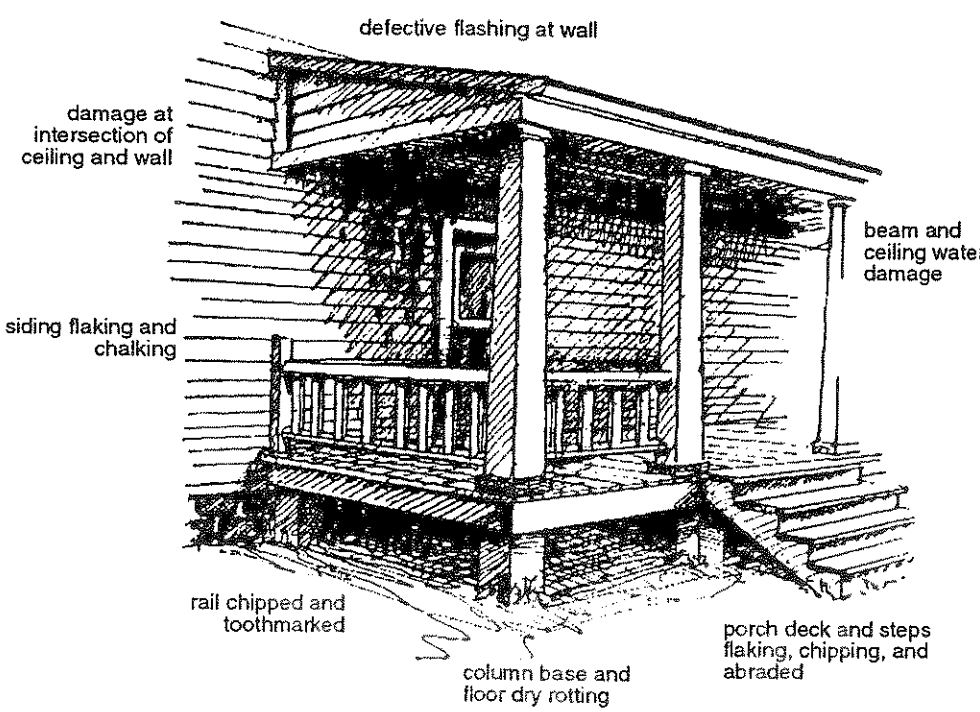
If exterior masonry fails it may no longer prevent water from entering and damaging interior surfaces or structural components. Examples include:

- **Eroded mortar joints.** Recommended repair: Remortar.
- **Masonry that has absorbed moisture.** Surface staining and prior patches can indicate a problem. Recommended repair: Apply surface sealant to protect against water infiltration.
- **Cracks in wall due to settling, vibration, or freeze/thaw cycle.** Recommended repair: Patch and seal. (Extensive delamination of stucco may require replacement.)
- **Spaces between architectural members.**

Porches

Porches that slope towards the building can result in water problems. Columns and other elements of a porch that are not waterproofed can decay. Recommended repairs: Replace porches to direct water away from the building, or install flashing and space porch boards away from the house to create a drainage zone. Remove paint on exposed porch components and soak with waterproofing compound.

Porch floorboards can also be covered with lead-based paint, causing constant impact and, if deteriorated, creating dust and chips. Such dust can then be tracked into the unit. Recommended repair: Replace floorboards or cover with new material.



Foundations

Foundations with visible cracks can be indicators of past or ongoing structural or settling problems. This can cause paint deterioration along the cracks (on exterior and interior paint) and allow moisture to enter the building. Recommended repair: If crack is result of past settling, fill and repaint bricks or paint other exterior surface cover. If crack is result of ongoing settling, consult building engineer.

Moisture Problems Outside the Dwelling

Moisture Problems Inside the Dwelling

Attic/Roof

Water stains on the inside of attics indicate roof problems that if not currently causing deteriorated paint may do so in the future.

The underside of the roof is a trouble spot that can indicate if there are water problems as water tends to collect in these areas.

Bathrooms

The following conditions in bathrooms can contribute to moisture damage.

- **Steam from showers**. A family of four each taking a 15 minute shower can produce over one and a half gallons of moisture in an already wet environment. Recommended action: Vent air to outside through a fan or regular opening of a window.
- **Lack of caulk around tub or failed shower enclosure**. Recommended action: Recaulk tub and educate occupants on importance of containing water.
- **Defective plumbing** (e.g., leaks, damaged wax seal on toilet, cracked fixtures). Recommended action: Repair problems.

Kitchen

Steam from cooking can contribute to moisture damage. Recommended action: Vent stove to outside.

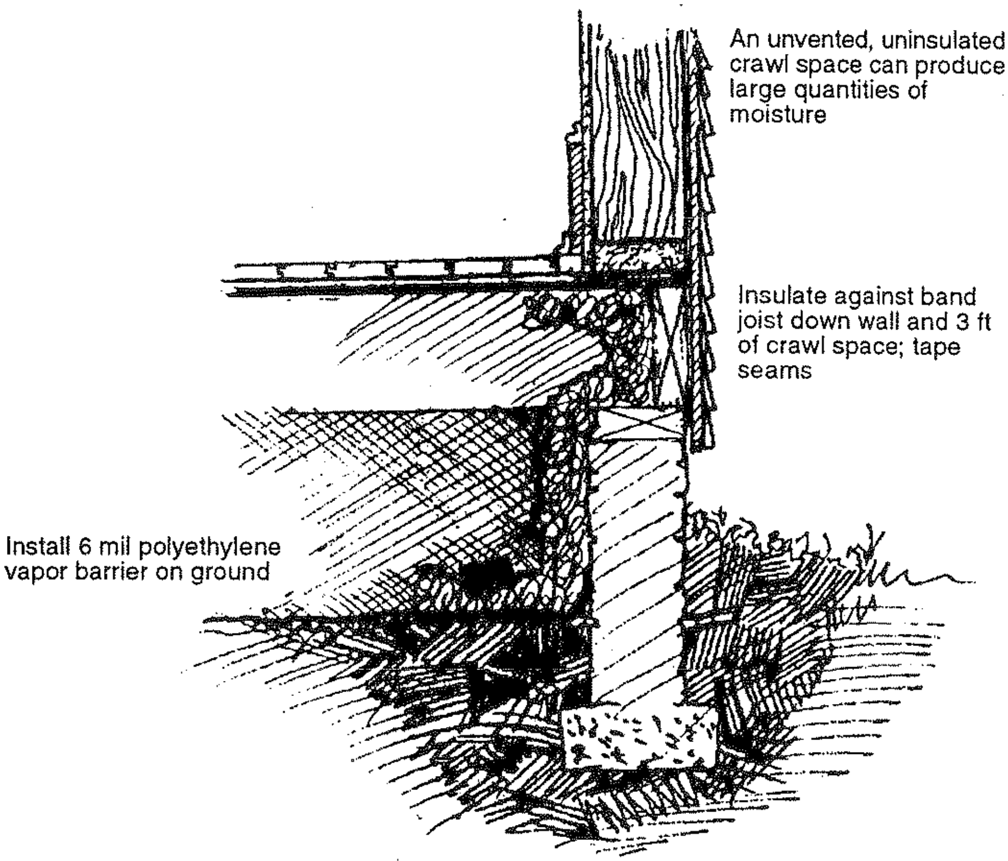
Doors, Stairs, Windows

Doors, stairs and windows can all be impact and friction points. Operate the doors and windows to see if rubbing exists. Look in window troughs for dust and along tracks for signs of rubbing. Recommended repair: Treat friction/impact surfaces or replace component.

Moisture Problems Inside the Dwelling

Basement or Crawl Space

- **Water or mildew stains.** These are indicators of water problems that can cause deteriorated paint.
- **Unvented dryers.** These can create sufficient humidity to cause deteriorated paint. Recommended action: Vent dryer to outside.



Other Problems

- **Mildew or water stains.** These are a sign of moisture damage.
- **Failing paint.**
- **Cracks.** These can be indicators of structural problems and/or moisture problems. Cracks can progress into more significant deteriorated paint and create lead-contaminated dust. The source of the problem should be identified before any hazard control measures are undertaken (e.g., paint film stabilization is not appropriate if the crack will simply return because there is any underlying structural problem).

Key Concepts

The purpose of the visual examination is for the risk assessor to locate and assess potential lead-based paint hazards and their causes.

A dwelling unit visual examination evaluates

- deteriorated paint and visible causes of such deterioration;
- visible dust accumulation;
- areas of bare residential soil;
- paint surfaces that are either impact points or subject to friction;
- painted surfaces where a child's chewing is suspected.

The focus of the visual examination should be locating current visible lead hazards.

A risk assessor determines whether a unit has lead-based paint hazards by locating areas where paint, dust, and soil may be hazardous and by conducting environmental sampling.

Evidence of poor maintenance may indicate that those lead hazard control options requiring frequent monitoring and repair by the owner will be inappropriate.

If paint on certain components is known through previous confirmatory tests or other information not to contain lead above the regulatory limit, it is not necessary for the risk assessor to evaluate its condition.

Paint chip sampling or XRF testing is appropriate when surfaces are in poor or fair condition.

The risk assessor should rate paint condition on building components using the intact, fair, and poor categories in the HUD *Guidelines*.

Determining the type and cause of the paint deterioration helps identify the most appropriate hazard control strategy.

Moisture, improper paint surface preparation or application, substrate failure, or impact and friction can potentially cause at least five categories of paint deterioration.

The exterior visual examination should address the roof; windows; porches; masonry and foundations; other painted surfaces; and bare residential soil.

The interior visual examination should address the attics; drop ceilings; windows; doors; baseboards and moldings; stairs and floors; plumbing; and the basement.

SECTION 5

Dust Sampling

Learning Objectives

After completing this section, the student should be able to

- name the strongest predictor of children's blood lead levels;
- identify two units of measure used to describe the amount of lead in dust and the differences between them;
- describe the recommended dust sampling method for most routine risk assessment work and the reasons for this recommendation;
- list the EPA- and HUD-recommended guidance levels of lead in dust in homes for identifying lead-based paint hazards and sources of exposure;
- name at least nine items a risk assessor needs to perform proper wipe sampling;
- name and perform at least twelve steps in the single-surface wipe sampling procedure;
- describe the four modifications to the single-surface wipe sampling procedure to obtain composite wipe samples and perform the procedure;
- describe six important compositing rules;
- identify the minimum number of separate composite dust samples for a dwelling;
- list the components and locations where composite samples should be collected;
- describe at least three precautions a risk assessor should take to decontaminate and avoid lead exposure;
- describe four rules to follow to avoid possible cross-sample contamination of wipes during the sampling process;
- describe and demonstrate how to avoid sample loss;
- summarize the protocol for incorporating blanks with samples;
- summarize the protocol for inserting spiked (control) samples and describe the appropriate follow up.

Importance of Dust as an Exposure Pathway

A number of studies have shown that dust is an important (but not the only) pathway of exposure to lead. Recently, studies have shown that dust lead levels are the strongest predictor of children's blood lead levels compared with a number of other variables. Proper measurement of dust lead levels is therefore essential to the risk assessment process.

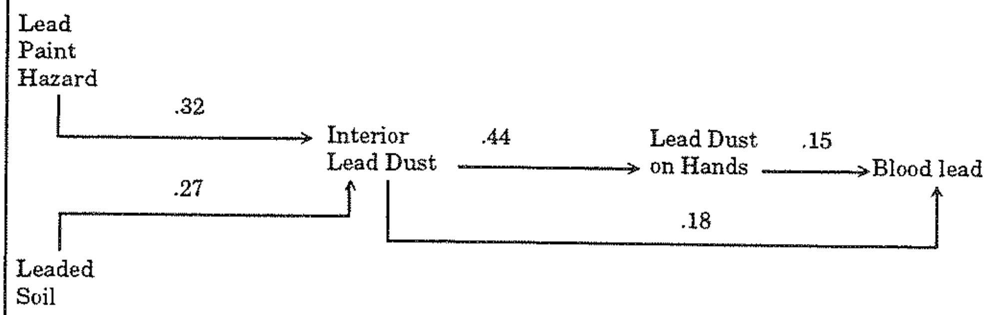
Some owners may question the usefulness of dust samples and whether or not it is really necessary to collect and analyze them. Owners may want proof that scientific research supports the importance of dust. A few research studies are listed below:

- The relation of lead-contaminated house dust and blood lead levels among urban children, Lanphear, Emond, Jacobs, et al. (in press), 1995.
- The longer-term effectiveness of residential lead paint abatement, Farfel et al., *Environmental Research* 66, 217-221, 1994.
- Childhood exposure to lead in surface dust and soil: A community health problem, Duggan and Inskip, *Public Health Review* 13, 1-54, 1985.
- Childhood lead poisoning: A controlled trial of dust control measures on blood lead levels, Charney et al., *New England Journal of Medicine* 309 (18), 1089-93, 1983.
- Urban soil lead abatement demonstration project, EPA/600/AP-93/001A, July 1993 (currently in review draft form only).
- Environmental correlates of infant blood lead levels in Boston, Rabinowitz et al., *Environmental Research* 38, 96-107, 1985.
- Exterior surface dust lead, interior house dust lead and childhood lead exposure in an urban environment, Bornschein et al., in *Trace Substances in Environmental Health II*, D. D. Hemphill, University of Missouri, Columbia, 1986.
- Urban lead exposures of children in Cincinnati, Ohio, Clark et al., *Chemical Speciation and Bioavailability* 3 (3/4), 163-171, 1991.
- *Does residential lead-based paint hazard control work? A review of the scientific evidence*, Catherine Staes and Richard Reinhart, National Center for Lead-safe Housing, Columbia, Maryland, 4 April 1995.

Importance of Dust as an Exposure Pathway

As an example, the Cincinnati study has validated the following model:

Lead Exposure Pathways in Urban Children



All estimated regression correlation coefficients are significant at $p<0.05$. This model involves a three-equation simultaneous structural model. These coefficients do not have units.

Adapted from Exterior Surface Dust Lead, Interior House Dust Lead and Childhood Lead Exposure in an Urban Environment, Bornschein et al., in *Trace Substances in Environmental Health II*, D. D. Hemphill, University of Missouri, Columbia, 1986.

This model demonstrates that there is a statistically significant relationship between lead-based paint and lead-contaminated soil with interior house dust. The house dust can be shown to be significantly related to both hand lead dust and directly to blood lead level. Finally, the lead dust levels measured on children's hands can also be significantly correlated with children's blood lead level. The most plausible explanation is that children ingest settled leaded dust through normal hand-to-mouth activity.

While some exposure reduction could conceivably occur by washing children's hands more frequently, crawling around on the floor and putting fingers and other objects into their mouths is normal in young children. Ultimately, restricting children's hand-to-mouth activity or constantly washing their hands is not feasible; thus, elimination of the lead dust (and its sources) are essential to achieving long-term reductions in lead levels.

Track-in of leaded soil into the interior can affect dust lead measurements. It is also possible to have high dust lead lead levels but no deteriorated lead-based paint. Therefore, it is usually necessary to measure dust lead, soil lead, and deteriorated paint. Sampling only one or two sources may yield an erroneous picture. An exception to this generalization involves a lead hazard screen (see Section 9 of this manual).

Units of Measure

There are two ways to describe the amount of lead in dust:

- loading (area concentration) ($\mu g/ft^2$ or $\mu g/cm^2$);
- mass concentration ($\mu g/g$, ppm, or mg/kg).

Loading is a measure of the total amount of lead present in micrograms of lead per square foot of surface area. Weight concentration is a measure of the amount of lead contained in dust, expressed in micrograms of lead per gram of dust ($\mu g/g$). These two units are not interchangeable and cannot be converted into the other on a routine basis; however, the two units of measure are often highly correlated. Loading can be reduced by cleaning while concentration may not.

Loading is measured directly by wipe sampling or vacuum sampling. Concentration is usually measured by vacuum sampling and cannot be measured by the standard wipe sampling methods taught in this course.

Wipe sampling is the recommended method for most routine risk assessment work for the following reasons:

- it is relatively simple and inexpensive;
- it has been correlated with children's blood lead levels in a number of studies;
- current EPA, HUD, and state standards are based on wipe sampling;
- vacuum sampling methods are not standardized;
- since there are no concentration standards, it is not possible to identify hazards using vacuum sampling.

For some research work, vacuum sampling is sometimes recommended instead of (or in addition to) wipe sampling. At the present time, there are no standards for vacuum sampling from either EPA or HUD, making interpretation of vacuum sampling results difficult. Standards for wipe sampling do exist, however.

Title X has given EPA the task of developing a health-based standard defining "dangerous levels" of lead in house dust. Until these standards have been developed, the following guidance levels, which are used by HUD for risk assessment work and by EPA in interim guidance (July 1994), should be used:

Units of Measure

Surface	Dust lead level ($\mu g/ft^2$) (as determined by wipe sampling only)
Floors	100
Interior window sills (stools)	500
Window troughs (wells)	800

Note: Some states may have different levels; risk assessors may need to evaluate results based on the local, state, or federal standard, whichever is most stringent.

- Interior window sills—The portion of the horizontal window ledge that protrudes into the interior of the room, adjacent to the window sash when closed; technically called the window "stool."
- Window trough—The portion of the horizontal window sill that receives both the upper and lower window sashes when they are both lowered, often located between the storm window and the interior window sash; sometimes called the window well. If there is no storm window, the window trough consists of the portion of horizontal window trim that contacts the sash(es) when they are closed (i.e., not the entire exterior sill). If there is only one sash, use the part of the window sill contacted by the sash when closed. See Figure 5.1 for an illustration of the window surfaces from which dust samples should be collected.
- Bare floors
- Carpeted floors (if present)

How much dust is this? Take a packet of coffee sweetener, which weighs 1 gram. If you were to spread this over 100 rooms, each measuring 10 feet by 10 feet, you would have:

$$100 \text{ rooms} \times 10 \text{ ft} \times 10 \text{ ft} = 10{,}000 \text{ ft}^2$$

Since 1 gram = 1 million micrograms:

$$\frac{1{,}000{,}000\ \mu g}{10{,}000\ ft^2} = 100\ \mu g/ft^2$$

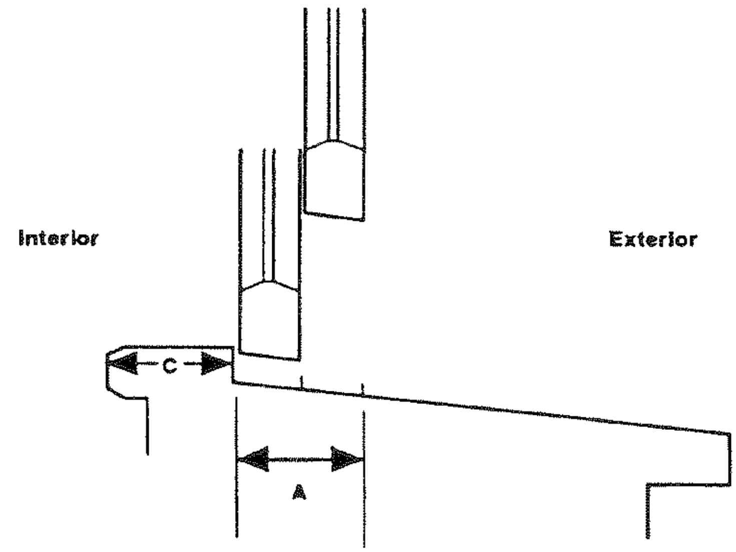
This means that we are interested in picking up only a few grains within a one square foot area. These grains may be invisible to the naked eye; thus, careful and complete sampling is needed.

Dust measurements cannot be made with the naked eye. For example, if the packet of coffee sweetener had a concentration of 100 $\mu g/g$ of lead and was spread over a 1 square foot area, the lead loading would be 100 $\mu g/ft^2$. However, if the coffee sweetener had a lead concentration of 1,000 $\mu g/g$, then only 1/10 of the packet spread over the surface would yield the same 100 $\mu g/ft^2$. The surface looks dustier in the first example than in the second, but the loading is exactly the same. The lead available to children is also the same. Therefore, measuring loading is always important. Relying on visual appearance alone will be inadequate.

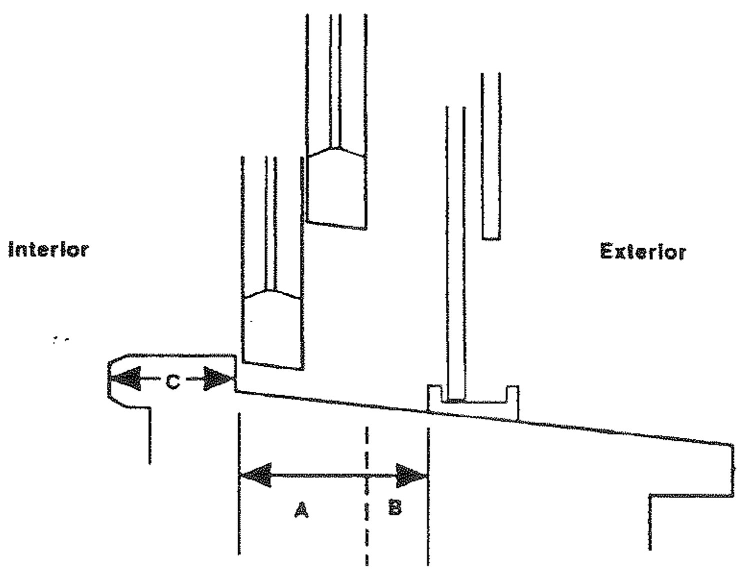
Because of the small amounts involved, measuring carefully and exactly the surface area wiped is absolutely necessary.

Units of Measure

Figure 5-1
Window Locations for Dust Sampling



1. Side view of window (with no storm window) showing window trough area, A, to be tested. Trough is strip across window sill where interior window sashes can touch the sill. The interior window sill is shown as area C. Interior window sills and window troughs should be sampled separately.



2. Side view of window (including storm window) showing window trough area, A and B, to be tested. Trough extends out to storm window frame. The interior window sill is shown as area C. Interior window sills and window troughs should be sampled separately.

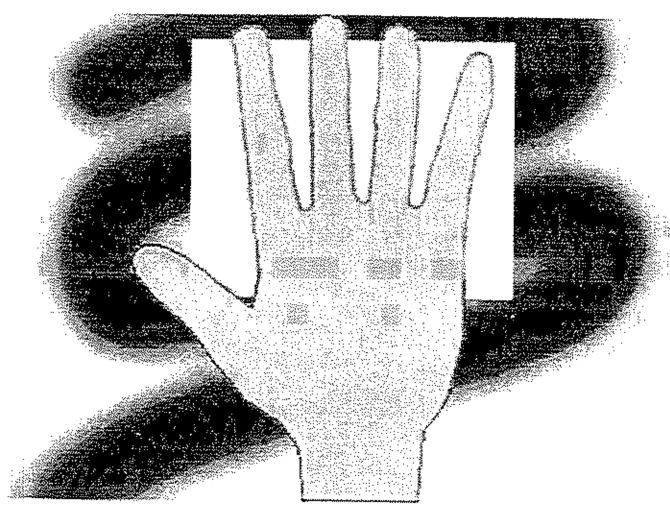
Courtesy: Warren Friedman

Wipe Sampling Protocol

Although other wipe sampling methods have been developed, this course teaches the wipe sampling protocols described by HUD, EPA, and American Society for Testing and Materials (ASTM) (ASTM ES-30). These protocols must be followed by risk assessors because the current standards were developed using only these methods.

The methods will be described, then demonstrated. In the practicum part of this course, an instructor will determine your proficiency in doing the wipe sampling. While the wipe sampling method is relatively easy, many students initially fail the practicum because they fail to exercise adequate care.

Wipe samples for settled lead dust can be collected from floors (both carpeted and uncarpeted); interior window sills and window troughs; and other reasonably smooth surfaces (e.g., stair treads, bookshelves). Wipe media should be sufficiently durable so that they are not easily torn but nevertheless can be easily digested in the laboratory. Recovery rates of between 80 to 120 percent of the true value should be obtained for all media used for wipe sampling. Blank media should contain no more than 5 µg/wipe.



Wipe Sampling Materials and Supplies

Type of Disposable Wipe

Any wipe material that meets the following criteria may be used:

- contains low background lead levels (less than 5 μg/wipe);
- is a single thickness;
- is durable and does not tear easily (do not use Whatman™ filters);
- does not contain aloe;
- can be digested in the laboratory;
- has been shown to yield 80 to 120 percent recovery rates from samples spiked with lead dust (not lead in solution);
- remains moist during the wipe sampling process (wipes containing alcohol may be used as long as they do not dry out).

Examples of acceptable wipe media include: "Little Ones Baby Wash Cloths™," "Little Ones Baby Wipes Natural Formula™," or "Little Ones Baby Wipes Lightly Scented™," available at K-Mart Stores. This product is also available under the brand names "Pure and Gentle Baby Wipes™" and "Fame Baby Wipes™." Individually packaged "Wash'n Dri Wipes™" or "Wash-a-Bye Baby™" are also acceptable. "Wet Wipes™," which are available at Walgreens and other stores, may also be used. Other brands are also acceptable if equivalence in both lead contamination (analysis of blanks) and laboratory digestion recoveries (analysis of wipes spiked with known amounts of leaded dust) can be established. The wipes listed above have proven to be sufficiently durable under field use and to have acceptable recovery rates. Do not use "Little Ones Diaper Wipes™," also available at K-Mart stores, or any other brand of wipes for which recovery data have not been established. Consult the analytical laboratory for additional advice on the appropriate wipe sample material. Do not use wipes that contain aloe because of possible background contamination from the soil the aloe plant was grown in. Wipes that contain alcohol may be used as long as they do not dry out during the wipe process. Any wipe material that yields 80 to 120 percent recoveries can be used (measured on wipes spiked with lead dust).

Nonsterilized, Nonpowdered Disposable Gloves

Disposable gloves are required to prevent cross-sample contamination from hands. Such gloves can be purchased from medical supply and drug stores. Some forms of talc used to powder gloves may have lead contamination.

Wipe Sampling Materials and Supplies

Centrifuge Tubes

Use nonsterilized polyethylene centrifuge tubes (50 ml size) with sealable caps or equivalent hard-shell container that can be rinsed quantitatively in the laboratory. These can be purchased from scientific equipment companies or medical or chemical supply companies.

Dust Sample Collection Forms

See Forms 5.4 or 5.4a in the HUD *Guidelines* (also found at the end of this section).

Template Options

- Masking tape. Masking tape is used on-site to define the area to be wiped. Masking tape is required when risk assessors are wiping window sills and window troughs in order to avoid contact with window jambs and channel edges. Masking tape on floors is used for outlining the exact area to be wiped.
- Hard, smooth, reusable templates made of laminated paper, metal, or plastic. Disposable templates are also permitted so long as they are not used for more than a single surface. Templates must be larger than 0.1 ft^2, but smaller than 2 ft^2. Templates for floors are typically 1 ft^2. Templates are usually not used for windows because of the variability in size and shape (risk assessors should use masking tape instead). Reusable templates must be cleaned after each sample. Note: Risk assessors should take periodic wipe samples from the templates to determine if the template is contaminated.

Additional Sampling Supplies

- Container labels or permanent marker
- Trash bag or other receptacle (do not use pockets or trash containers at the residence)
- Rack, bag, or box to carry tubes (optional)
- Measuring tape
- Disposable shoe coverings (optional).

Single-surface Wipe Sampling Procedure

Outline Wipe Area

Floors: Identify the area to be wiped. Do not walk on or touch the surface to be sampled (the wipe area). Apply adhesive tape to the perimeter of the wipe area to form a square or rectangle of about one square foot. No measurement is required at this time. The tape should be positioned in a straight line, and corners should be nominally perpendicular. When putting down any template, do not touch the wipe area.

Window sills and other rectangular surfaces: Identify the area to be wiped. Do not touch the wipe area. Apply two strips of adhesive tape across the ends of the sill to define a wipe area at least 0.1 square foot in size (at least 4 inches x 4 inches). It is not necessary to tape the length of the window sill.

When using tape, do not cross the boundary tape or floor markings, but be sure to wipe the entire sampling area. It is permissible to touch the tape with the wipe but not the surface beyond the tape.

Preliminary Inspection of the Disposable Wipes

Inspect the wipes to determine if they are moist. If they have dried out, do not use them. When using a container that dispenses wipes through a "pop-up" lid, the first wipe in the dispenser at the beginning of the day should be thrown away. The first wipe may be contaminated by the lid and is likely to have dried to some extent. Rotate the container before starting to ensure liquid inside the container contacts the wipes.

Preparation of Centrifuge Tubes

Examine the centrifuge tubes and make sure that the tubes match the tubes containing the blind spiked wipe samples. Partially unscrew the cap on the centrifuge tube to be sure that it can be opened. Do not use plastic bags to transport or temporarily hold wipe samples. The laboratory cannot measure lead left on the interior surface of the plastic bag.

Gloves

Put a disposable glove on one hand; use a new glove for each sample collected. If you need to use two hands to handle the sample, use two new gloves, one for each hand. It is not necessary for you to wipe the gloved hand before sampling. Use a new glove for each sample collected. Do not touch any surface other than the wipe after putting on the glove.

Single-surface Wipe Sampling Procedure

Initial Placement of Wipe

Place the wipe at one corner of the surface to be wiped with wipe fully opened and flat on the surface.

First Wipe Pass (side-to-side)

With the fingers together, grasp the wipe between the thumb and the palm. Press down firmly, but not excessively with both the palm and fingers (avoid using the heel of the hand). Do not touch the surface with the thumb. If the wipe area is a square, proceed to wipe side-to-side with as many "S"-like motions as are necessary to completely cover the entire wipe area. (See explanation below for nonsquare areas.) Exerting excessive pressure on the wipe will cause it to curl. Exerting too little pressure will result in poor collection of dust. Do not use only the fingertips to hold down the wipe, because there will not be complete contact with the surface and some dust may be missed. Attempt to remove all visible dust from the wipe area.

Second Wipe Pass (top-to-bottom)

Fold the wipe in half with the contaminated side facing inward. (You can straighten out the wipe by laying it on the wipe area, contaminated side up, and folding it over.) Once the wipe is folded, place it in the top corner of the wipe area and press down firmly with the palm and fingers. Repeat wiping the area with "S"-like motions; but, on the second pass, move in a top-to-bottom direction. Attempt to remove all visible dust. Do not touch the contaminated side of the wipe with the hand or fingers. Do not shake the wipe in an attempt to straighten it out, since dust may be lost during shaking.

(Note: The ASTM method adds a third pass around the perimeter of the area wiped.)

Rectangular Areas (e.g., window sills)

If the surface is a rectangle (such as a window sill), two side-to-side passes must be made, the second pass with the wipe folded so that the contaminated side faces inward. For a window sill, do not attempt to wipe the irregular edges presented by the contour of the window channel. Avoid touching other portions of the window with the wipe. If paint chips or gross debris are in the window sill, attempt to include as much of it as possible on the wipe. If all of the material cannot be picked up with one wipe, field personnel may use a second wipe at their discretion and insert it in the same container. Consult with the analytical laboratory to determine if they can perform the analysis with two wipes as a single sample. When performing single-surface sampling, do not use more than

Single-surface Wipe Sampling Procedure

two single-surface wipes for each container. If the area is heavily dust laden, a smaller area should be wiped. It is not necessary for you to wipe the entire window trough, but do not wipe less than 0.10 ft^2 (at least 4" x 4").

Paint Chips: Many window troughs contain paint chips or other gross debris. Remove large sticks or stones or other debris, but do not remove paint chips. Attempt to include any paint chips that adhere to the moist wipe material. Larger paint chips that do not adhere on the wipe do not need to be included in the sample.

Packaging the Wipe

After wiping, fold the wipe with the contaminated side facing inward again, and insert the wipe aseptically (without touching anything else) into the centrifuge tube or other hard-shelled container. Roll or fold the wipe into the container to avoid losing sample when inserting the wipe into the tube If gross debris is present, such as paint chips in a window trough, make every attempt to include as much of the debris as possible in the wipe.

Labelling the Centrifuge Tube

Seal the tube, and label it with the appropriate identifier. Record the laboratory submittal sample number on the field sampling form (found at the end of this section; more information is in Sections 6 and 15).

Area Measurement

After sampling, measure the surface area wiped to the nearest eighth of an inch using a tape measure or a ruler. The size of the area wiped must be at least 0.10 ft^2 for an adequate limit of quantitation to be obtained (25 μg/wipe is the typical detection limit with flame AA; 25 μg/0.10 square feet = 250 $\mu g/ft^2$, which is half of the HUD clearance criterion for interior window sills). No more than 2 square feet should be wiped with the same wipe, or else the wipe may fall apart or dry out. Record specific measurements for each area wiped on the field sampling form.

Form Completion

Fill out the appropriate field sampling forms completely. Collect and maintain any field notes regarding type of wipe used, lot number, collection protocol, etc.

Single-surface Wipe Sampling Procedure

Trash Disposal

After sampling, remove the masking tape and throw it away in a trash bag. Remove the glove(s); put all contaminated gloves and sampling debris used for the sampling period into a trash bag. Remove the trash bag when leaving the dwelling. Do not throw away gloves or wipes inside the dwelling unit where they could be accessible to young children, resulting in a suffocation hazard.

Repeat all of the above steps for additional samples in the same dwelling unit.

Composite Wipe Sampling

Whenever composite sampling is contemplated, consult with the analytical laboratory to determine if the laboratory is capable of analyzing composite samples. No more than four individual wipes should be included in each composite sample. When conducting composite wipe sampling, you should use the procedure stated above with the following modifications:

When outlining the wipe areas, set up all of the areas to be wiped before sampling. The size of these areas should be roughly equivalent, so that one room is not over sampled.

After preparing the centrifuge tube, put on the glove(s) and complete the wiping procedures for all subsamples. A separate wipe must be used for each area sampled. After wiping each area, carefully insert the wipe sample into the same centrifuge tube (no more than four wipes per tube).

Risk assessors and inspector technicians do not have to remove their gloves between subsample wipes for the same composite sample as long as their gloved hands do not touch an area outside of the wipe areas. If a glove is contaminated, the glove should be immediately replaced with a clean glove.

Once all subsamples are in the tube, label the tube. Record a separate measurement for each area that is subsampled on the field collection form (see Form 5.4a or Form 14.2a for a sample form). Be certain to report the *total* surface area wiped to the laboratory. Finally, complete trash disposal, making sure that no masking tape is left behind.

Rules for Composite Sampling

In addition to these procedural modifications, you should observe the following rules for compositing:

- Separate composite samples are required from carpeted and hard surfaces (e.g., a single composite sample should not be collected from both carpeted and bare floors). Whenever possible, hard floors should be sampled instead of carpets. Collection efficiencies may vary considerably on carpets.
- Separate composite samples are required from each different component sampled (e.g., a composite sample should *not* be collected with both floor and window sill subsamples contained in one composite sample).
- Separate composite samples are required for each dwelling.
- Floor surface areas sampled in each room should be approximately the same size (1 ft^2 or 929 cm^2). Window trough and interior window

Composite Wipe Sampling

sill sampling sizes are dependent on window characteristics but should be as similar as possible from room to room (e.g., the surface sampling area should not be skewed so that one room is over sampled).

- Do not use the same wipe to sample two different spots. Always use a new wipe for each spot sampled.
- Do not insert more than four different wipes into a single container for a composite sample. Acceptable recovery rates (80 to 120 percent of the "true" value) have been found when no more than four wipes are analyzed as a single sample.
- If composite samples are collected, blank and spike (control) QA/QC samples should also be submitted for analysis.

Blank Preparation

After sampling the final dwelling unit of the day, but before decontamination, you should obtain field blank samples. Analysis of the field blank samples determines if the sample media are contaminated. Each field blank should be labeled with a unique identifier similar to the others so that the laboratory does not know which sample is the blank (i.e., the laboratory should be "blind" to the blank sample).

Collect blank wipes by removing a wipe from the container with a new glove, shaking the wipe open, refolding as it occurs during the actual sampling procedure, and then inserting it into the centrifuge tube without touching any surface or other object. One blank wipe is collected for each dwelling unit sampled or, if more than one dwelling unit is sampled per day, one blank for every 50 field samples, whichever is less. Also, collect one blank for every lot used. Record the lot number on the field sampling form.

Risk Assessor Decontamination

During sampling, inspectors must not eat, drink, smoke, or otherwise cause hand to mouth contact.

After sampling, wash hands thoroughly with plenty of soap and water before getting into a vehicle. You can use a bathroom in the dwelling unit for this purpose, with the owner's or resident's permission. If there is no running water in the dwelling unit, use wet wipes to clean your hands.

Spike Sample Submission

Samples spiked with a known amount of lead dust (sometimes called "control samples") should be inserted into the sample stream randomly by the person conducting field sampling to determine if there is adequate quality control of the digestion process at the laboratory. Dust-spiked wipe samples should be submitted blindly to the laboratory by the individual performing field sampling at the rate of no less than one for every fifty field samples. Any laboratory can spike wipe samples using the procedure in Appendix 14.3 in the 1995 HUD *Guidelines*. The laboratory performing the analysis of the field samples can also prepare the spike sample as long as the person performing the field sampling makes the spike sample indistinguishable from the field samples. The person conducting the field sampling should take the spike sample prepared in the laboratory and relabel the container with an identifier similar to the other field samples. The spike sample wipe should not be put into another container. Spike samples should be made using the same lot number of wipe media as that used in the field.

A dust-spiked sample is defined as a wipe or filter containing a known weight of lead-based paint dust, measured to the nearest 0.1 µg of lead dust. A dust-spiked sample is prepared in a laboratory with the amount of lead-based dust present being between 50 to 1000 µg. For wipe samples, labs should use *NIST Standard 1579a* ("Powdered Lead-based Paint") or an equivalent secondary standard. See Appendix 14.3 in the HUD *Guidelines* for further details.

Quality Assurance/Quality Control

Blind analysis of spiked samples must fall within 80 to 120 percent of the true value. If the laboratory fails to obtain readings within the QA/QC error limits:

- Two more spikes should be sent immediately to the lab for analysis.
- If either of the two additional spike samples fails, the sample batch should be considered invalid. A full review of laboratory procedures may be necessary. Additional samples may need to be collected from the dwelling units from locations near the locations previously sampled.

If more than 50 µg/wipe is detected in a blank sample, the samples should be collected again since the media are contaminated. Blank correction of wipe samples is *not* recommended.

Advantages and Disadvantages of Composite Wipe Sampling

Many types of environmental samples are composited in order to make them more representative of larger areas. For example, soil samples are routinely combined from separate areas into one large sample, which is then mixed and combined into one. Air samples are often composited over time to express time-weighted averages. Wipe samples can also be composited.

Advantages are

- a lower cost per surface sampled;
- increased surface area that can be wiped for the same cost.

Disadvantages are that

- information on a specific sampling location is lost;
- laboratories will have to adopt special handling and digestion procedures.

If composite sampling is used, a minimum of three separate composite dust samples should be collected. A fourth composite sample would be needed if wall-to-wall carpets are present. The composite samples should be collected from the following components:

- bare floors (or carpeted floors for wall-to-wall carpeting);
- window sills;
- window trough.

When to Use Single-surface and Composite Wipe Samples

Single-surface wipe samples should be used

- when information is needed to determine leaded dust levels in a specific location. For example, pet sleeping areas, porch areas, laundry areas where contaminated clothing is washed, or lead hobby areas;
- in other areas where leaded dust levels are expected to be high to determine if targeted cleaning efforts are needed.

Composite wipe samples should be used

- when controlling costs is essential;
- when there is no reason to suspect that dust levels from the same types of surfaces in different rooms will vary greatly;
- when the costs of multiple-room cleanup will not greatly exceed the cost of single room cleanup.

The determination of whether to use single-surface or composite samples is a matter of professional judgment to be exercised on a case-by-case basis. One exception to this is the lead hazard screen, which involves the collection of composite samples from floors and window troughs. Even here, the risk assessor may choose to collect single-surface samples; of course, the owner should be contacted to ensure that the cost of these extra samples is acceptable.

Number and Location of Wipe Samples

For composite samples, the following rooms should be sampled (at a minimum):

- principal play room for children (usually the TV room, living room, or dining room);
- kitchen;
- bedroom of the youngest child who is over 6 months of age (children under 6 months are unlikely to be exposed to dust);
- bedroom of the next oldest child.

The preceding locations for subsamples can be used for both single-family and multifamily dwelling risk assessments. However, substitute locations will be necessary in dwellings where the room designations cannot be determined. For example, in vacant units the living room should be substituted for the play room and the smallest bedroom for the youngest child's room.

For single-surface samples, at least six to eight dust samples are necessary for evaluating the hazards in each dwelling.

Children are most likely to come into contact with dust in the following areas:

- entry way (including porches);
- child's principal play area (usually the TV room, living room, or dining room);
- children's bedrooms
- kitchen
- bathroom

Within these rooms, components that are likely to have high dust levels are

- floors near friction or impact spots or in areas with deteriorated paint;
- interior window sills (of frequently opened windows);
- window trough (of frequently opened windows);
- cabinets with deteriorated paint (housing dishes, toothbrushes, eating utensils, etc.).

Avoiding Cross-sample Contamination

Since the hands are used to touch the wipe sampling media, the potential for cross-contamination is high. Cross-contamination means that other surfaces coming into contact with the wipe could deposit lead on the wipe; in this case, we can't tell if the lead on the wipe came from these other surfaces or from the surface sampled. Risk assessors can follow several easy rules to eliminate this problem:

- Always change gloves for each sample collected. For composite samples, gloves need to be changed only for each composite, not for each subsample.
- After donning the glove, do not touch anything else other than the wipe and the surface to be sampled.
- If the wipe is dropped or if you accidentally wipe an area outside the marked area, discard the wipe and sample another nearby area.
- Discard the first wipe from the dispenser at the start of each dwelling unit sampled.
- Fold the wipe completely before inserting the wipe into the tube to avoid sample loss in the packaging process.

Sampling Data Forms

HUD Lead-based Paint Guidelines Form 5.4, Field Sampling Form for Dust (Single-surface Sampling), and HUD Lead-based Paint Guidelines Form 5.4a, Field Sampling Form for Dust (Composite Sampling), included on the two following pages, are taken from the HUD *Guidelines* and can be used for recording dust sampling data.

HUD Lead-based Paint Guidelines Form 5.4
Field Sampling Form For Dust (Single-surface Sampling)

Name of risk assessor ___________________________

Name of property owner ___________________________

Property address ____________________ Apt. no.__________

Dwelling selection protocol _____ All dwellings _____ Targeted _____ Worst case _____ Random

Target dwelling criteria (check all that apply)

_____ Code violations

_____ Judged to be in poor condition

_____ Presence of two or more children between ages of 6 months and 6 years

_____ Serves as day-care facility

_____ Recently prepared for reoccupancy

Sample number	Room (record name of room used by the owner or resident)	Surface type	Is surface smooth and cleanable?	Dimensions? of sample area (inches x inches)	Area (ft²)	Result of lab analysis (µg/ft²)
	Play room ________	Floor		____ x ____		
	Play room ________	Interior window sill or window trough		____ x ____		
	Kitchen ________	Floor		____ x ____		
	Kitchen ________	Interior window sill or window trough		____ x ____		
	Bedroom 1 ________	Floor		____ x ____		
	Bedroom 1 ________	Interior window sill or window trough		____ x ____		
	Bedroom 2 ________	Floor		____ x ____		
	Bedroom 2 ________	Interior window sill or window trough		____ x ____		
				____ x ____		
				____ x ____		
	Blank					

[1] Measure to the nearest 1/8 inch.

HUD standards: 100 µg/ft² (floors), 500 µg/ft² (interior window sills), 800 µg/ft² (window trough)

Total number of samples this page_______

Page ________ of ________

Date of sample collection____/____/____ Date shipped to lab____/____/____

Shipped by ________________________________ Received by ____________________________

(signature) (signature)

HUD Lead-based Paint Guidelines Form 5.4a
Field Sampling Form for Dust (Composite Sampling)

Name of risk assessor ____________________

Name of property owner ____________________

Property address ______________ Apt. no.________

Dwelling selection protocol _____ All dwellings _____ Targeted _____ Worst case _____ Random

Target dwelling criteria (check all that apply)

_____ Code violations

_____ Judged to be in poor condition

_____ Presence of two or more children between ages of 6 months and 6 years

_____ Serves as day-care facility

_____ Recently prepared for reoccupancy

Sample number	Record name of rooms used by owner or resident to be included in sample	Dimensions[1] of surface sampled in each room (Inches x inches)	Total surface area sampled (ft^2)	Type of surface sampled	Is surface smooth and cleanable?	Lab Result (µg/ft^2)
	________ ________ ________ ________	____ x ____ ____ x ____ ____ x ____ ____ x ____		Smooth floors		
	________ ________ ________ ________	____ x ____ ____ x ____ ____ x ____ ____ x ____		Carpeted floors		
	________ ________ ________ ________	____ x ____ ____ x ____ ____ x ____ ____ x ____		Interior window sills		
	________ ________ ________ ________	____ x ____ ____ x ____ ____ x ____ ____ x ____		Window troughs		

[1] Measure to the nearest 1/8 inch.

HUD standards: 100 µg/ft^2 (floors), 500 µg/ft^2 (interior window sills), 800 µg/ft^2 (window trough)

Total number of samples this page_______

Page ________ of ________

Date of sample collection____/____/____ Date shipped to lab____/____/____

Shipped by ______________________________ Received by ___________________________
(signature) (signature)

Wipe Sampling Demonstration

The instructor will show a videotape and then demonstrate the procedure. The workshop will include use of the practicum. Each student will be evaluated by the instructor using the check-off list, which will be signed by the instructor to demonstrate proficiency. Students who cannot master the technique will be granted extra practice, as time permits.

Wipe Sampling Practicum

Name ______________________________

Training Institution ______________________________

Training Date ______________________________

Check List

#	Criteria	1st	2nd
1.	Uses clean technique		
	• Puts glove(s) on after set-up		
	• Has adequate method for handling wipe		
	• Removes wipe and shakes open correctly		
2.	First wipe: side-to-side		
	• Presses down firmly—palms & fingers		
	• S-like motion, more than one “S”		
	• Pressure adequate		
	• Wipes entire surface		
	• Does not cross boundary		
3.	Second wipe: top-to-bottom		
	• Folds in half, wipes on clean side		
	• Does not shake out contents during folding		
	• S-like motion		
	• Wipes entire surface		
	• Does not cross boundary		
4.	Folds and insert into tube		
	• Does not touch other objects		
	• Does not loose surface debris		
5.	Measures and records accurately		
6.	Completes form and labels tube		
	Passed (Yes/No)		

Instructor ______________________________

Date ____________________

Key Concepts

Dust is an important exposure pathway.

Recent studies show that dust lead levels are the strongest predictor of children's blood lead levels. Accurate dust sampling and proper measurement of dust lead levels are extremely important steps in determining lead hazards in a dwelling unit.

Two noninterchangeable, nonconvertible units of measure used to describe the amount of lead in dust are:

- loading, a measure of total lead present in micrograms of lead per square foot of surface area ($\mu g/ft^2$ or mg/m^2);
- weight concentration, a measure of lead in dust expressed in micrograms of lead per gram of dust ($\mu g/g$ or ppm or mg/kg).

Wipe sampling, which measures dust loading, is the recommended method for most routine risk assessment work.

HUD has issued guidance on levels of lead in dust in homes for identifying lead-based paint hazards and sources of exposure:

Floors	100 $\mu g/ft^2$
Window Sills	500 $\mu g/ft^2$
Window Troughs (Wells)	800 $\mu g/ft^2$

EPA has adopted the same levels based on what is achievable through abatement and interim control activities and not on projected health effects.

Wipe Sampling Protocol

A risk assessor needs at least eleven items to perform proper wipe sampling: disposable wipes; nonsterilized nonpowdered disposable gloves; nonsterilized polyethylene centrifuge tubes; dust sample collection forms; templates; container labels or permanent marker; trash bag; sample tube bag, box, or rack; measuring tape; and disposable shoe coverings (optional).

The single-surface wipe sampling procedure consists of at least twelve steps. These steps are: outlining the wipe area; preliminary inspection of disposable gloves; sampling tube preparation; donning glove(s); initial placement of wipe; side-to-side wipe pass; top-to-bottom wipe pass; folding and packing the wipe into the sample container; labelling the sampling tube; measuring the area sampled; completing the sampling form; and disposing of tape, gloves, and any other sampling debris.

The composite wipe sample procedure uses the single-surface wipe sampling procedure and the following four modifications:

- Set up equivalent wipe areas.
- Use a separate wipe for each sample area, inserting up to 4 wipes into a single centrifuge tube.
- For the same composite sample, it is not necessary to replace gloves between subsample wipes, as long as nothing else is touched.
- Label each tube after samples have been inserted; record each area measurement on the field collection form; and dispose of trash.

Key Concepts

SECTION 6

Lead in Soil

Learning Objectives

At the end of this section, students should be able to:

- explain how soil exposure contributes to the blood-lead levels found in children;
- identify at least five ways that soil surrounding a dwelling can become contaminated with lead;
- describe three reasons for testing any bare soil around a dwelling and in play areas during a lead-based paint risk assessment;
- name the units of measure commonly used to express soil lead levels;
- identify the EPA guidance soil lead levels where control measures should be implemented;
- name at least six response activities identified by EPA and HUD for residential lead-contaminated bare soil.;
- identify the major reason for collecting composite soil samples as opposed to individual samples;
- list at least ten items needed to conduct soil sampling;
- identify the recommended minimum number of subsamples to be collected as a single composite soil sample during a routine residential lead-based paint risk assessment;
- describe and demonstrate how routine residential lead-based paint risk assessment composite samples should be collected;
- describe how to treat paint chips if they are present in the soil matrix to be sampled;
- list the two main areas where bare soil samples are typically collected during a routine lead-based paint risk assessment;
- name at least four items a risk assessor should sketch out on a site sketch; and
- identify the laboratory accreditation programs recognized by EPA for soil lead analysis and three laboratory methods for analyzing soil core samples.

Sources of Lead in Soil

Several studies have shown that soil contaminated with lead contributes significantly to the blood lead levels found in children. The exposure occurs through direct ingestion of soil, "track-in" of soil into the interior of the dwelling, or through a combination of the two. The dust studies presented in the previous section also demonstrated that soil is an important source of exposure, which indicates that both bare soil and dust should be sampled during routine residential risk assessments.

The soil surrounding a dwelling can be contaminated with lead from several different sources. Sources of contamination include:

- weathering and "chalking" of lead-based paint on the building's exterior;
- nearby demolition or renovation activities;
- previous repainting jobs involving scraping of exterior lead-based paint;
- airborne contamination from the emissions of engines burning leaded gasoline in past years. (Although leaded gasoline has been generally phased out under an EPA ban, millions of tons of lead entered the environment from this source up until the late 1980s. For dwellings close to highways or major surface streets, considerable lead contamination of the soil is possible);
- point sources of airborne lead such as lead smelters and battery manufacturing plants. This type of contamination is relatively uncommon, but it can be significant in some areas of the country.

In yards where soil has been contaminated with lead, children are directly exposed to contamination when they get their hands dirty in the soil, and then put their fingers or other objects into their mouths. Lead-contaminated soil is also a potential source of lead in interior house dust, since residents and their pets can easily track soil into the dwelling. In addition, vegetables grown on lead-contaminated soil may take up lead and be ingested by the residents of the dwelling. Thus, testing of any bare soil around a dwelling and in play areas is required for lead-based paint risk assessments.

Title X defines contaminated "bare soil" to be a lead-based paint hazard if the lead concentration is above certain levels. Therefore, it is not necessary to sample soil that already has a good grass or other vegetative cover, unless there is some reason to believe that soil lead levels may be unusually high (above 5,000 µg/g).

Units of Measure

Soil lead levels are always expressed in micrograms of lead per gram of soil (µg/g). This is equivalent to milligrams per kilogram (mg/kg) or parts per million by weight (ppm). Some laboratories may also report concentration in weight percent, which can be converted to µg/g by moving the decimal point to the right four places:

$$0.5\% = 5{,}000\ \mu g/g = 5{,}000\ mg/kg$$

As in the case of leaded dust, there is currently no Federal health-based standard for levels of lead in soil. Until a Federal standard is developed, a guidance level has been developed by EPA (see **Appendix** for the Guidance document).

Until health-based standards are established, EPA's guidance states the following levels of concern for bare soil lead concentrations:

- 400 µg/g — high contact play areas
- 2,000 µg/g — other residential yard areas
- 5,000 µg/g — levels requiring permanent abatement (paving or removal)

The recommended response is based on the area of concern and the likelihood of contact by children. The recommended response activities at these levels are summarized in the following table.

Table 1
EPA Recommendations for Response Activities for Residential Lead-contaminated Bare Soil

Area of Concern	Bare Soil Lead Concentration (ppm)	Recommended Response Activities
Areas expected to be used by children, including: • residential backyards, • daycare and school yards, • playgrounds, • public parks, and • other areas where children gather.	400–5,000	Interim controls to change use patterns and establish barriers between children and contaminated soil, including: • planting ground cover or shrubbery to reduce exposure to bare soil, • moving play equipment away from contaminated bare soil, • restricting access through posting, fencing, or other actions, and • controlling further contamination of area. Monitor condition of interim controls. Public notice of contaminated common areas by local agency.
	> 5,000	Abatement of soil, including: • removal and replacement of contaminated soil, or • permanent barriers (e.g., paving). Public notice of contaminated common areas by local agency.
Areas where contact by children is less likely or infrequent	2,000–5,000	Interim controls to change use patterns and establish barriers between children and contaminated soil, including: • planting ground cover or shrubbery to reduce exposure to bare soil, • moving play equipment away from contaminated bare soil, • restricting access through posting, fencing, or other actions, and • controlling further contamination of area. Monitor condition of interim controls. Public notice of contaminated common areas by local agency.
	> 5,000	Abatement of soil, including: • removal and replacement of contaminated soil, or • permanent barriers (e.g., paving). Public notice of contaminated common areas by local agency.

Soil Sampling Protocol

Soil sampling protocols for lead are available from EPA, HUD, and ASTM (ES-29).

Compositing

In order to reduce variability, all soil samples collected for routine residential lead-based paint risk assessment 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 the child's principal play area(s) (if it can be identified) and a second composite sample is collected from the building foundation. Each composite sample usually consists of 3–10 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 centrifuge tubes described in the previous section to hold wipe samples can be used for this purpose. The risk assessor should collect soil no deeper than ½ 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.

Since both professional core and disposable syringe sampling tools have both been correlated with children's blood-lead level, either may be used.

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 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 operator 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 Equipment

The following equipment is necessary to conduct soil sampling:

- soil coring device, handle, and hammer attachment or equivalent (hammer is optional);
- stainless steel spatula or spoon (or disposable plastic);
- 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;
- data collection forms (example provided on page 6-17).

Blank and Control Samples

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

Depth

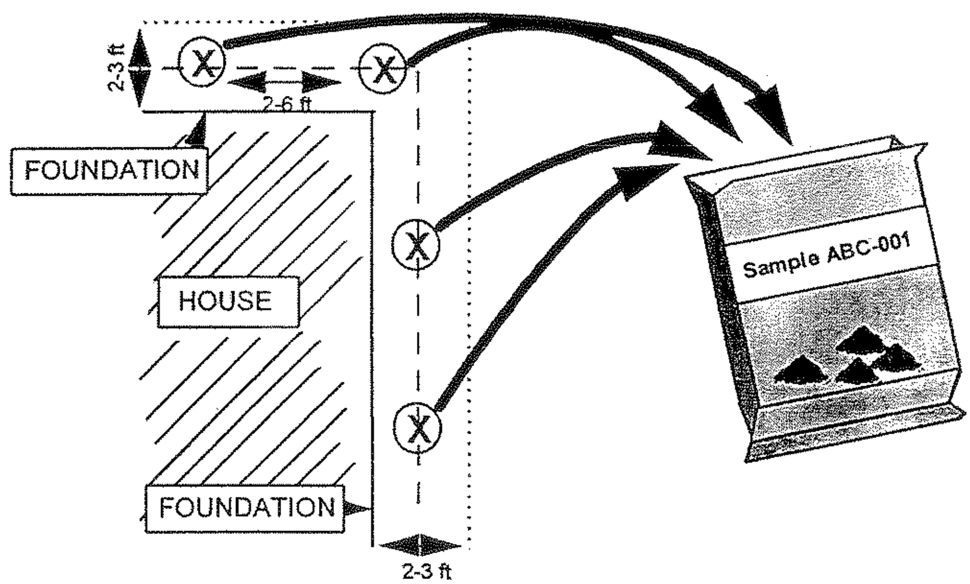
The depth of soil to be sampled is the top ½ inch (1 cm), since that is the surface a child contacts most frequently. Soil samples collected in this fashion have been correlated with children's blood-lead level in previous studies.

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, two composite samples per dwelling will be adequate (one from the play area, the other from the building foundation). Each composite sample should consist of 3–10 subsamples, with each subsample collected roughly along a straight line. Sampling bare areas is more important than maintaining a straight line. Risk assessors should exercise judgement to determine if other areas should be sampled, such as:

- gardens;
- pet sleeping areas;
- parking areas possibly contaminated from vehicle exhaust; or
- sandboxes.



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.

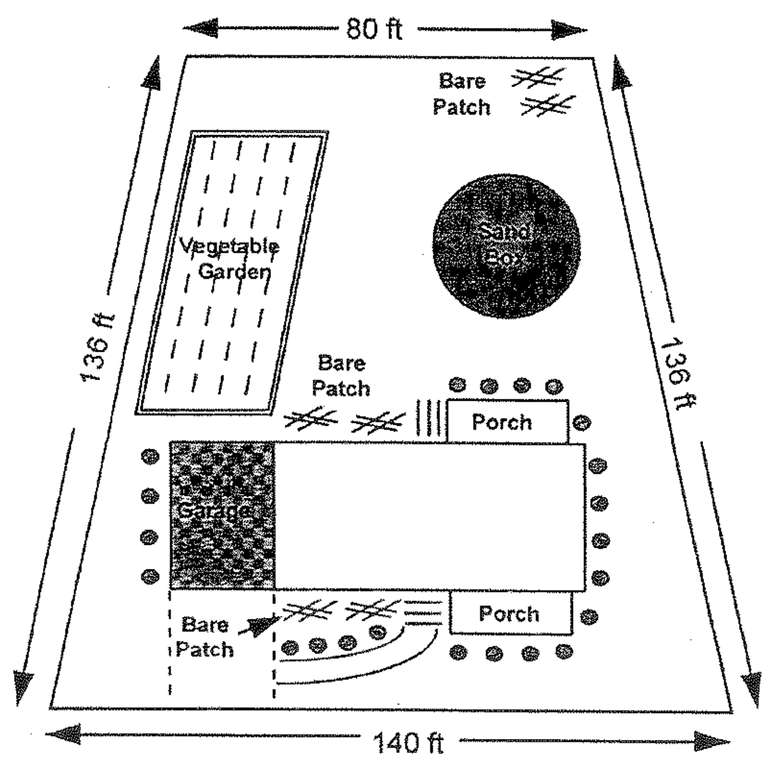
Sketches

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.



Note: Not drawn to scale.

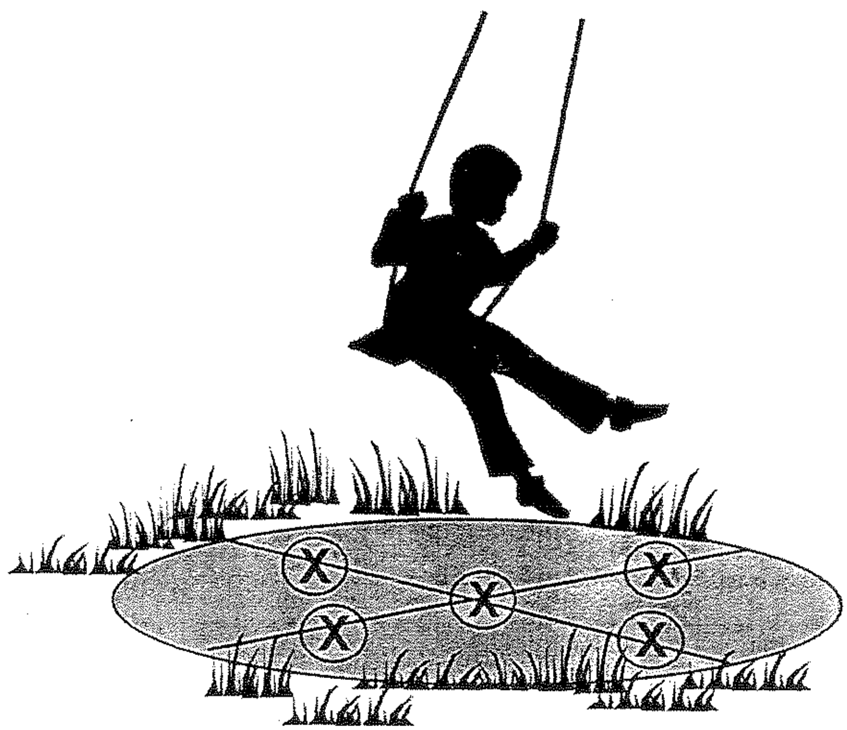
Example of site description showing lot boundary, building location, garage location, play area (sand box), and areas of bare soil, including vegetable garden

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 3–10 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

Laboratory analysis of soil core samples for lead are carried out using a laboratory X-ray Fluorescence (XRF) instrument or by acid digestion followed by Atomic Absorption Spectroscopy (AAS) or Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP). XRF instruments manufactured for paint analysis are unlikely to be adequate for soil analysis.

For each method, the laboratory should sieve the soil to remove gross debris, followed by drying the sample to a constant weight. Typically, 1 gram of the homogenized sample is analyzed.

Because a single composite sample consists of 3–10 soil cores, the composite sample's lead concentration represents an average soil lead concentration over the entire area where the cores are taken. For example, a composite consisting of five cores taken at random locations near the foundation represents an estimate of the average soil-lead concentration close to the foundation of the dwelling.

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

Documentation

Soil sampling data can be recorded on the following form from the HUD *Guidelines*.

HUD Lead-Based Paint Guidelines Form 5.5
Field Sampling Form For Soil
(Composite Sampling Only)

Name of risk assessor ____________________
Name of property owner ____________________
Property address ____________________

Sample no.	Location	Bare or covered	Lab result (μg/g)
	Building perimeter		
	Building perimeter		
	Play area 1 (describe) ____________		
	Play area 2 (describe) ____________		

Collect only the top ½ inch of soil.

Total number of samples this page______
Page ________ of ________
Date of sample collection___/___/___ Date shipped to lab___/___/___

Shipped by ____________________ Received by ____________________
(signature) (signature)

Key Concepts

Research shows that exposure to lead occurs through direct ingestion of bare soil, and/or "track-in" of lead contaminated soil into the interior of the dwelling. Both significantly contribute to the blood-lead levels found in children.

Soil surrounding a dwelling can be contaminated with lead from:

- weathering and "chalking" of lead-based paint on the building's exterior;
- nearby demolition or renovation;
- previous scraping of exterior lead-based paint;
- airborne contamination from previous leaded gasoline burning engines; and
- emissions from industrial sources such as lead smelters and battery manufacturing plants.

Testing of any bare soil around a dwelling and in play areas is required for lead-based paint risk assessments because lead in soil is a direct source of lead exposure to children playing in the yard, and it is a potential source of lead in interior house dust. Lead in soil also may be taken up by vegetables grown on contaminated soil and ingested by the residents of the dwelling.

Soil lead levels are typically expressed in micrograms of lead per gram of soil (µg/g).

Until a Federal health-based standard is developed, EPA and HUD guidance levels for residence soil hazards are:

- 400 µg/g in high-contact play areas
- 2,000 µg/g in other areas of the yard

Levels up to 5,000 µg/g can be corrected with simple covering of bare spots. Soil lead levels above 5,000 µg/g should be removed or paved over.

EPA's recommended response activities for residential lead-contaminated bare soil include:

- establishing barriers between children and contaminated soil;
- separating the children from the contaminated soil;
- removing and replacing contaminated soil;
- informing the public about the contaminated soil; and
- periodically monitoring its condition.

Because soil lead levels can vary greatly at a single dwelling, soil from different spots are mixed together into composite samples. Each routine residential lead-based paint risk assessment composite sample consists of 3–10 subsamples.

Key Concepts

SECTION 7

Sampling Deteriorated Paint and Reviewing XRF Reports

Learning Objectives

After completing this section, students should be able to

- define what constitutes deteriorated lead-based paint;
- describe the applicable federal standards for lead-based paint measurement and analysis for risk assessment purposes;
- describe at least four considerations for selecting testing locations on painted surfaces to take XRF readings or paint chip samples;
- identify at least five reasons why risk assessors should measure all paint layers when sampling for lead on surfaces;
- describe at least three major steps involved in taking XRF measurements and demonstrate how to properly measure lead paint content;
- identify at least four major considerations when preparing paint chip samples;
- identify at least four major considerations when choosing laboratories and analytical methods;
- identify the uses and limitations of the four currently available lead-paint testing and analysis methods;
- identify at least seven essential items that should be reviewed to determine if previous XRF paint inspection findings are reliable;
- describe how the process of compositing paint chips is used to determine if sampled surfaces exceed acceptable limits for lead content;
- identify at least two major considerations when compositing paint chip samples for analysis; and
- describe at least six ways to avoid potential sources of error in paint sampling and analysis.

Introduction

Deteriorated paint is a lead-based paint hazard only

- if it meets the "poor" definition discussed in the visual assessment part of this course (greater than 2 ft^2 deterioration on components with large surface areas or greater than 10 percent of total surface area of small components or greater than 10 ft^2 on large exterior surfaces);

  and

- if it contains lead above the applicable federal or local standard.

Deteriorated paint that contains lower levels of lead or a lower level of deterioration can also result in significant problems, so owners should always be encouraged to repair any deteriorated paint using safe, wet methods described later in this manual. Deteriorated areas smaller than those defined as poor should also be repaired before they get larger and pose a significant hazard. However, it is important that the risk assessor help the owner focus priority attention on deteriorated lead-based paint over a significant surface area.

Therefore, a risk assessor

- should never state that deteriorated paint is "safe" if lead levels are less than the applicable standard;
- should state that if lead is present above the applicable standard, then it constitutes a lead-based paint hazard if it is deteriorated and should receive priority attention.

Standards

The applicable federal standards are 1.0 mg/cm^2, which can be measured either by portable XRF or laboratory analysis, or 5,000 µg/g, which can only be measured by laboratory analysis. Local standards may be different. Both of these can be measured from the same sample. Risk assessors should use either federal or local standards, whichever is more stringent.

5,000 µg/g is equivalent to 5,000 ppm by weight, 5,000 mg/kg, or 0.5 percent by weight (the weight percent level requires moving the decimal point four places to the left). For example:

$$5{,}000\ \mu g/g = 0.5\%$$

When to Measure Lead in Paint

When to Measure Lead in Paint for Risk Assessment

All deteriorated paint films should be measured to determine if they contain levels of lead above the applicable limit. If there are a large number of surfaces with deteriorated paint, it may make sense to complete a full inspection at the same time, since the added expense is not great.

In most cases, risk assessments will result in a need to measure 2–10 paint films. Paint films can be composited to reduce the expense, especially if it is likely that none of the paint films will be above the standard.

When Not to Measure Lead in Paint For Risk Assessment

The following surfaces do not need to be characterized for lead content in risk assessments

- friction surfaces;
- impact surfaces;
- accessible or chewable surfaces.

The extent to which these surfaces pose a lead hazard will be determined through analysis of dust sampling data (friction & impact surfaces) and visual assessment (accessible and chewable), not through XRF or lab analysis of paint chips. The visual assessment section of this course explains how to do that. Of course, if these surfaces are deteriorated, they should be measured for lead content.

Paint does not need to be measured for lead content if adequate testing reports are available showing that testing has been completed in the past. Risk assessors should always determine if testing reports are adequate by reviewing the reports using the checklist found in this section.

Methods of Measuring Lead in Deteriorated Paint Films

This section reviews issues related to deteriorated paint films only. The student must have already been trained in paint film sampling and measurement procedures from the EPA inspector course.

The lead content in deteriorated paint films should be determined by using either portable XRF analysis or laboratory analysis.

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).

Why Sampling All Paint Layers is Necessary

If the purpose of risk assessment is to identify lead-based paint hazards, why not measure only the layers that are defective? Several reasons to sample all layers include:

Methods of Measuring Lead in Deteriorated Paint Films

- 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 activity 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).

XRF Analysis

Risk assessors should begin XRF analysis by following the manufacturer's instructions, the *Technical Performance Sheet* for the XRF instrument used, and Chapter 7 of the new HUD *Guidelines*. Even though only a few surfaces may be analyzed, the full instrument warm-up and calibration check procedures are required.

The risk assessor should take three readings across any given surface, making sure that each spot selected has all layers present. The lead paint content is the average of those three readings, minus any bias (substrate) correction or other procedures specified in the *Technical Performance Sheet*. All calibration checks and raw data should be included in the report.

XRF analysis of deteriorated paint films may be more cost effective than laboratory paint chip analysis, especially in those dwellings containing a large number of deteriorated surfaces, where laboratory analytical costs will be extensive.

Laboratory Paint Chip Analysis

Paint chip analysis can be done using atomic absorption spectroscopy (AA) or inductively coupled plasma emission spectroscopy (ICP). the laboratory can report the results of the lead level in either of two units:

- mg/cm^2

  If results are to be reported in mg/cm^2 (as recommended in the new HUD *Guidelines*), the area sampled must be measured *exactly* (a

Methods of Measuring Lead in Deteriorated Paint Films

small amount of substrate can be included in the sample for this method).

- µg/g, ppm, weight percent, or mg/kg

If results are reported using any of these units, the area sampled need not be measured exactly, but all layers must be included in the sample. Every effort must be made to exclude substrate in this method because including substrate material will increase the total weight and dilute the lead content. This is used if the surface area cannot be measured exactly.

For paint chip analysis, only one location on each type of painted surface or building component needs to be measured.

For most laboratories, a sample of about 2 inches × 2 inches (or any other dimensions resulting in a total surface area of about 4 square inches) should produce enough paint for routine analysis by flame AA. Smaller sizes may be acceptable if graphite furnace, ICP, or another, more sensitive method is used.

Nonrecommended Methods of Paint Analysis

The following methods are not adequate for measuring lead in deteriorated paint films:

- Portable XRF analysis of paint chips: This method cannot be used, since it is not possible to characterize the surface area exactly. Therefore, using a large number of small paint chips and spreading them out uniformly over a measured surface area will not produce a known surface area available for analysis.
- Chemical Spot Test Kits: Although these kits hold some promise for the future, they are not recommended by EPA or HUD at this time (April 1995).

Laboratories

All laboratories used by risk assessors for paint film analysis should be certified through one of the organizations in the EPA National Lead Laboratory Accreditation Program (NLLAP). At this time, these organizations include:

- American Association for Laboratory Accreditation (A2LA)
- American Industrial Hygiene Association (AIHA)

Laboratories participating in the Environmental Lead Proficiency Testing (ELPAT) program can be used if they supply evidence that they have applied for accreditation.

Methods of Measuring Lead in Deteriorated Paint Films

Laboratories should not be used if they participate in ELPAT but are not willing to be certified, or if they do not participate in either ELPAT or NLLAP.

Portable Laboratories

Some new technologies have appeared which may make laboratory level accuracy and precision available in the field. These technologies include the portable Anodic Stripping Voltametry (ASV) kits and laser technology. Should these field technologies be accredited, they may be used by risk assessors. Proper sample preparation is still required.

Tips for Proper Deteriorated Paint Film Sampling

- All layers should be analyzed. Risk assessors should not sample only the peeling or deteriorated layers.
- If the area selected for sampling is intact and is representative of the paint film history, a heat gun may be used to soften the paint for easy removal.
- Risk assessors should see ASTM Standard E-28.
- Hard-shelled containers should be used to transport paint samples. These containers must be used if results will be given in mg/cm^2. The laboratory must be instructed either to analyze the entire sample sent or to perform homogenization and subsampling to report the total micrograms of lead in the sample. The laboratory should quantitatively rinse the container.
- Plastic bags ("baggies") are acceptable only if results are to be reported in µg/g, ppm, or weight percent.
- The risk assessor should always measure the area sampled after collecting the sample to ensure that the measurement is done accurately.

Review of Previous Paint Testing

If previous paint testing has been performed, the risk assessor should always review the report to be sure the owner can rely on the data to determine which surfaces have lead-based paint and which do not. The checklist on the following page can be used to review the paper report.

Reviewing Paint Inspection Reports

Part One		Yes	No
1	Did the report clearly explain the entire testing program and include an executive summary in narrative form?		
2	Did the report provide an itemized list of similar building components (testing combinations) and the percentage of each component that tested positive, negative, and inconclusive? (Percentages are needed only for multi-family dwellings.)		
3	Did the report include test results for any common areas and the building exteriors as well as the interior of the dwelling units?		
4	Were all of the painted surfaces that are known to exist in the dwelling units, common areas, and building exteriors included in the itemized list of components that were tested? For risk assessment, were all painted surfaces now deteriorated actually measured?		
5	Do the owners fully comprehend the report and completely understand their responsibilities regarding further testing or hazard control?		
6	If confirmation testing of inconclusive results (laboratory testing) was necessary, did the testing firm amend the final report and revise the list of surfaces that tested positive, negative, and inconclusive?		
7	Was the unit selection process performed randomly and were enough units tested? (Multi-family housing only)		
Part Two			
8	Is the name of the XRF Manufacturer, Model Number, and Serial Number of the XRF that was used in each unit recorded in the report?		
9	Did the report record the XRF calibration checks for each day that testing was performed?		
10	Did the calibration checks indicate that the instrument was operating within ± 0.5 mg/cm^2 of the recorded reading or other applicable quality control value (see applicable *Technical Performance Sheet*)?		
11	Were three readings collected for each surface (if necessary)?		
12	Were substrate corrections performed (if necessary)?		
13	Were confirmatory paint chip samples collected for readings in the inconclusive range for the instrument used? (See the *Technical Performance Sheet* for the instrument used.)		
14	Was the procedure that was used to collect the paint chip samples described?		
15	Was the laboratory that analyzed the paint samples identified?		

Review of Previous Paint Testing

If the review shows that testing may have been unreliable, the risk assessor should recommend some type of repeated or supplemental testing, depending on the results of the review. For example, if no substrate correction was performed but should have been, the risk assessor should recommend that substrate correction readings be made and results of the inspection recalculated.

Unless the owner requests it, most risk assessments will involve a paper review of previous testing, not repeated analysis.

Composite Paint Chip Sampling

In order to reduce costs, it is possible to combine separate paint chip samples into a single composite sample. The results can be used to determine only if any of the composite samples can possibly be over the applicable limit. If the composite testing results come back positive for lead, only analysis of single surface samples can determine exactly which one(s) is/are over or under the limit (if any). Results of composite samples *cannot* be used to determine exactly which paint chips are over the limit.

In all cases where composite sampling is contemplated, the risk assessor must contact the laboratory first to determine if the laboratory is capable of performing this analysis. Some laboratories (even those accredited under the EPA) may choose not to perform this analytical procedure, or they may impose certain restrictions and increase the analytical cost.

Composite samples are usually collected by surface area, not weight percent. If results are reported in weight percent (ppm, mg/kg, or µg/g), it will be necessary for the risk assessor to collect separate single surface samples in the field. The laboratory will then weigh each sample and combine them into a single homogeneous sample for analysis.

If composite results are reported in mg/cm^2, the risk assessor can perform compositing in the field, but only if each paint sample is *exactly* the same size. The use of a template is recommended. The risk assessor can composite these samples in the field.

Interpreting Composite Sample Results

Composite paint chip sampling is essentially a negative screen — the results will indicate whether or not any of the surfaces sampled could be over the limit.

To interpret results, the risk assessor should divide the applicable standard by the number of subsamples in the composite (in most cases, no more than five subsamples should be composited).

For example: using the federal standard of 1.0 mg/cm^2 and assuming that the paint chip samples to be combined each measure 2 in × 2 in exactly, the action level for this composite sample is 0.2 mg/cm^2

$$\frac{1.0\ \text{mg/cm}^2}{5\ \text{subsamples}} = 0.2\ \text{mg/cm}^2$$

If the composite results come back with levels equal to or more than 0.2 mg/cm^2, one of the subsamples may have lead-based paint above 1.0 mg/cm^2. Further analysis of individual samples will then be needed. To

Composite Paint Chip Sampling

prevent making a separate trip back, the risk assessor should collect duplicate samples and hold them for further analysis.

If the composite results come back with less than 0.2 mg/cm^2, then it is not possible for any subsample to have more than 1.0 mg/cm^2.

It is not necessary to perform this calculation for composite dust samples because knowledge of the loading on a single surface is not necessary. Composite dust samples represent the average across all surfaces sampled. For paint, knowledge of the concentration on a given surface is required. The cost of cleaning additional surfaces should not be significant, while the cost of abating paint from additional surfaces is.

Documentation

The following two forms from the HUD *Guidelines* can be used to record data for paint chip sampling. If XRF instruments are used, the applicable forms from Chapter 7 of the HUD *Guidelines* should be used.

Documentation

HUD Lead-Based Paint Guidelines Form 5.3
Field Sampling Form for Deteriorated Paint
(One form for each housing unit, common area, or exterior)

Name of risk assessor ________________________

Name of property owner ________________________

Property address ____ Apt. no.____

Dwelling selection protocol:

_____All dwellings _____Targeted _____Worst-case _____Random

Target dwelling criteria (check all that apply)

_____ Code violations

_____ Judged to be in poor condition

_____ Presence of two or more children between ages of 6 months and 6 years

_____ Serves as day-care facility

_____ Recently prepared for re-occupancy

_____ Random sampling

Sample Number	Room	Building Component	Lead (mg/cm^2 or $\mu g/g$)
HUD interim standard			5,000 $\mu g/g$ or 1.0 mg/cm^2

Sample all layers of paint, not just deteriorated paint layers.

Total number of samples this page_______

Page ________ of ________

Date of sample collection____/____/____ Date shipped to lab____/____/____

Shipped by ________________________ Received by ________________________

(signature) (signature)

Date results reported ____/____/____

Analyzed by__________________________

Approved by__________________________

HUD Lead-Based Paint Guidelines Form 5.3a
Field Sampling Form for Deteriorated Paint
(Composite Sampling)

Name of risk assessor ____________________________

Name of property owner ____________________________

Property address ____ Apt. no._____

Dwelling selection protocol:

_____All dwellings _____Targeted _____Worst-case _____Random

Target dwelling criteria (check all that apply)

_____ Code violations

_____ Judged to be in poor condition

_____ Presence of two or more children between ages of 6 months and 6 years

_____ Serves as day-care facility

_____ Recently prepared for re-occupancy

_____ Random sampling

Composite sample number	Component Samples	Rooms Included in Sample	Duplicate Subsample Number	Size of Subsample (cm x cm)	Lab Result (mg/cm^2)	Lab Result ($\mu g/g$)
HUD interim standard*					1.0*	5,000*

* For composite samples, the HUD standard must be divided by the number of subsamples in the composite sample.

Total number of samples this page________

Page _________ of _________

Date of sample collection____/____/____ Date shipped to lab____/____/____

Shipped by ___________________________ Received by ___________________________

(signature) (signature)

Sources of Error

Sources of potential error in deteriorated paint film analysis include

- Measuring or sampling a spot where the deterioration is such that the lead layer has fallen off or been removed by previous repainting jobs;
- Including the substrate in weight percent analysis;
- Failing to measure exactly the surface area of the paint film;
- Non-quantitative transfer (e.g., use of baggies instead of hard-shelled containers, such as 50 ml non-sterilized but clean polypropylene centrifuge tubes);
- Failure to observe all paint film surfaces to determine paint deterioration;
- Failure to include all layers in the sample;
- Failure to notify the laboratory that the results must be reported in total µg of lead/sample, as well as mg/cm^2 or µg/g.

Key Concepts

- Deteriorated paint is a lead-based paint hazard if
  - the size of the area of deterioration is greater than 2 square feet on components with large surface areas (e.g., walls) or 10 percent of the total surface area of small components (e.g., trim) or greater than 10 ft^2 on large exterior surfaces;

  and

  - the lead content is greater than or equal to 1.0 mg/cm^2 or 0.5 percent (5,000 µg/g) by weight.
- If smaller areas of deterioration are identified, or if the lead content is just below the standard, owners should be encouraged to repair the areas using safe, wet methods.
- Risk assessors must always state that lead-based paint which is deteriorated and exceeds applicable standards constitutes a hazard.
- Paint measurements can be completed either by portable XRF or laboratory analysis.
- Lead hazards from friction, impact, or accessible or chewable surfaces are determined through dust analysis and visual assessment, not through XRF or paint chip analysis (unless those surfaces are deteriorated).
- Portable XRF analysis or laboratory analysis should be used to determine the lead content in deteriorated paint films.
- Lead content changes considerably across a given surface and even more across a surface where spots have missing layers.
- When testing for lead paint, risk assessors should select a test area where
  - all layers are present;
  - there is the least deterioration;
  - the smallest possible amount of substrate is included with the paint sample;
  - destructive paint chip sampling is unobtrusive, such as
    - behind pictures or furniture;
    - near corners; and
    - underneath protruding surfaces.

- Risk assessors should include all paint layers because
  - sampling all layers costs the same as sampling deteriorated layers;
  - repairing deteriorated layers may cause abrasion of intact leaded layers, resulting in lead dust generation;
  - owners can avoid expensive repeated sampling and safely plan future renovation, remodeling or repainting activity;
  - it is not yet technologically possible to consistently distinguish which paint layers do or do not contain lead, either by XRF or laboratory analysis;
  - XRF readings and laboratory analysis can only yield equivalent results if all layers are sampled.

Key Concepts

SECTION 8

Water Sampling

Learning Objectives

After completing this section, students should be able to:

- demonstrate proper sampling techniques for lead in drinking water;
- understand the possible sources and causes of lead contamination;
- understand why most routine residential lead-based paint risk assessments *will not* require water sampling;
- state the levels of lead in drinking water deemed to be unacceptable by EPA;
- name the four things that EPA may require when drinking water is contaminated with lead;
- state how long water should remain motionless in the plumbing system before collecting water samples;
- state how long water samples can be stored before laboratory analysis is completed;
- state the size of a first draw water sample; and
- be able to refer owners to agencies with authority over drinking water purity.

Introduction

Drinking water can be a source of significant lead exposure in some situations. Except for that found in some industrial, mining, and other commercial areas, most groundwater in the U.S. is relatively free of lead contamination. Most lead in drinking water is introduced by corrosion of water distribution and residential plumbing systems.

The EPA has established an ongoing monitoring program to help determine when corrective measures need to be taken. These programs are designed to be implemented at the community level. In many cases, the corrective measures are implemented at central water treatment facilities.

In order to avoid duplication of effort, Title X does not define lead contamination in water to be a lead-based paint hazard. Also, in many cases, it will be beyond the control of the owner to effect any corrective measures. Therefore, most routine lead-based paint risk assessments will not involve the collection of water samples and the determination of corrective measures. Nevertheless, in some communities where drinking water contamination is a significant issue, or where owners wish to have water samples collected, risk assessors may provide water sampling as an adjunct to lead-based paint risk assessment.

This section provides a brief overview of applicable standards, sampling methods, corrective measures, and sources of further assistance to which risk assessors can refer owners.

Standards

The EPA National Primary Drinking Water Regulations for Lead established a treatment trigger of 15 ppb. When 90 percent or more of drinking water taps in a given community exceed this level, the regulations require:

- corrosion control treatment (usually implemented by the local water authority);
- source water treatment;
- public education; and
- lead service line replacement.

Equivalent units of measure that may be used by different laboratories include:

$$15 \text{ ppb} = 15\ \mu g/l = 0.015\ mg/l$$

Sampling Methods

Sampling methods are rather straightforward. In most cases, the initial sample will consist of a one liter sample collected from the kitchen or bathroom cold water tap after the water has stood motionless for at least 6 hours. This is typically done in the morning before any water has been used by residents; however, if the residents work during the day, the sample can be collected at the end of the day (as long as no water has been used). The tap most commonly used for drinking water should be sampled.

In most situations, this "first flush" sample will represent a worst case sample. Additional samples following the first flush may be collected if there is some reason to believe that other parts of the water system (such as leaded service lines, valves, or water mains) are contributing lead. The EPA model curriculum, "Inspecting for Lead Hazards in Residences," addresses techniques for multi-sampling for lead in water.

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 require the laboratory to acidify the original container.

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.

Sources of Further Assistance

The EPA operates a **Safe Drinking Water Hotline** (1-800-426-4791). In addition, risk assessors can have the owner contact the local water treatment facility. The risk assessor can also contact the local authority directly to determine if lead in drinking water is a significant problem in the area.

Key Concepts

- The EPA has established a program to control lead levels in drinking water, which can be a significant source of exposure to lead in some areas.
- Because Title X does not define water as a lead-based paint hazard, and because building owners may not be able to control lead in water, water sampling is not required for most lead-based paint risk assessments.
- Risk assessors should be prepared to conduct water sampling if the owner requests it.
- Most lead in drinking water is introduced by plumbing system corrosion, not from groundwater.
- The EPA drinking water limit is 15 ppb (or 15 µg/l or 0.015 mg/l). If the levels are greater than this, the EPA may require:
  - corrosion control treatment (usually implemented by the local water authority;
  - source water treatment;
  - public education; and
  - lead service line replacement.
- A one liter sample should be collected from the residential tap most commonly used for drinking water after the water has remained motionless for 6 hours.
- Water samples should not be stored for more than 28 hours before analysis, unless acidification is completed.

SECTION 9

Lead Hazard Screen

Learning Objectives

After completing this section, students should be able to

- state when the lead hazard screen is an appropriate evaluation method;
- state the differences between a lead hazard screen and a full risk assessment;
- know the number of environmental samples that should be taken;
- know how to interpret screen sample results.

Introduction

Owners of housing that is in good physical condition may be interested in having the risk assessor conduct a lead hazard screen. (A unit is judged to be in good condition if it is not scored as "poor" using the building form.) A lead hazard screen is an abbreviated type of risk assessment. It is designed specifically for homes that are likely to be free of lead hazards. The lead hazard screen involves fewer environmental samples and less data collection but has more stringent dust guidance levels. Thus, the screen is designed to reduce the evaluation costs for the owner, while also protecting the health of the residents.

Units in poor condition are not good candidates for the screen, since interior dust levels and paint deterioration make it unlikely that the unit will pass the more stringent dust levels used in the screen. In this case, the unit would then need to undergo a complete risk assessment at an additional cost to the owner.

Lead Hazard Screen Sampling Protocols

The lead hazard screen should be considered a part of the risk assessment protocol, acting as a "negative" screen. If the results of the screen indicate that lead hazards are not present, then no further testing is required. If the results of the screen indicate that lead hazards may be present, then the risk assessor should conduct a full risk assessment. Risk assessors should note that the screen does not necessarily prove that a hazard exists.

Because the criteria that are used to determine whether a lead hazard is present are more stringent in a lead hazard screen, a unit may fail the screen but later be shown to be free of hazards.

The chart on the following page describes the differences between a lead hazard screen and a full risk assessment.

Comparison Between a Lead Hazard Screen and a Full Risk Assessment

	Screen	Full Assessment
Paint	Full review of painted surfaces 1 Paint chip/ "poor" surface	Full review of painted surfaces 1 Paint chip/ "poor" surface
Dust	2 Composite 1 Floor (include entryway) 1 Window trough	3 or 4 Composite 1 Uncarpeted floor (include entryway) 1 Window sill 1 Window trough (1 Carpeted floor) Or 6–8 single surface
Soil	No	2 Composite 1 Foundation 1 Play areas
Water	No	No*
Air	No	No
Housing condition	Yes	Yes
Use patterns assessment	No	Yes
Management & maintenance data	No	Optional Dependent on property type

* Water may be sampled if requested by the owner.

Excerpted from the HUD *Guidelines*

Visual Inspection/Paint Sampling

A lead hazard screen begins with the risk inspector's 5- to 15-minute visual inspection of all painted surfaces in a dwelling unit to look for deteriorated paint. All painted surfaces that are classified as being in poor condition should be noted. The assessor should use the same system of classification of paint conditions as used for a full risk assessment. (A table of paint conditions is found in Section 4, Visual Examination.) In dwelling units where there are a limited number of painted components with "poor" paint, the assessor should collect a composite paint chip sample from all of these components. Alternatively, single surface paint chip sampling is acceptable.

If a number of the surfaces have paint in poor condition (generally more than five), then the risk assessor should recommend to the owner that the owner proceed with a full risk assessment or a paint inspection. This recommendation makes sense because

- as the percentage of deteriorated surfaces increases, the likelihood that one surface will fail increases. If one surface fails, a full risk assessment will be needed, requiring a return visit to the dwelling unit;
- each paint chip that is collected requires additional analysis costs. When many paint samples will be tested, an XRF inspection will typically be more cost effective.

Dust Sampling

The assessor should collect two composite dust samples from the dwelling unit. One sample should be collected from uncarpeted floors, and one sample should be collected from window troughs. If all floor surfaces are carpeted, then the carpet should be wipe sampled. Four individual wipes should be included in each composite sample. Each composite should include dust samples from the bedrooms and the interior play area of young children living in the unit. A floor subsample should also be collected from the main entryway (the front porch or interior entryway). If less than four individual samples are collected using these criteria, the assessor should use best judgement to decide which other room to sample.

Lead Hazard Screen
Locations for Composite Dust Sampling

Uncarpeted floors

- 1st child's bedroom
- 2nd child's bedroom
- Children's principal play area
- Main entryway
- Additional location (if necessary)

Window troughs

- 1st child's bedroom
- 2nd child's bedroom
- Children's principal play area
- Additional locations (high-use windows)

Additional Sampling

No additional sampling or other information is necessary for a lead hazard screen. Additional sampling will only be required if the lead hazard screen fails and a full risk assessment is required.

Lead Hazard Screen Results

The following describes the criteria necessary for a risk assessor to determine if a unit passes a lead hazard screen for paint and dust samples.

Paint Samples

Risk assessors should use the same evaluation methods and standards for composite paint samples collected during a lead hazard screen as samples collected during a full risk assessment. (Students should review the composite paint sampling found in Section 7, Deteriorated Paint Sampling.) The standard for lead in paint for **both** full risk assessments and lead hazard screens collected as a single surface (noncomposite) sample is

1 mg/cm^2 or 5,000 $\mu g/g$ or 0.5%

Hazard levels for screen are

paint (single surface—same as HUD) = 1.0 mg/cm^2 or 5,000 ppm or 0.5%

If a composite is collected, the lead-based paint standard should be divided by the number of subsamples contained in the composite sample. For example, if the sample will be analyzed by weight, the composite paint standard for a sample containing four subsamples would be

5,000 ppm / 4 = 1,250 ppm

Dust Samples

The HUD standards for dust samples collected during a lead hazard screen are more stringent than the standards used during a full risk assessment. The EPA clearance guidance levels for dust samples are divided in half, so that the lead hazard screen dust standards are

floors = 50 $\mu g/ft^2$

window troughs = 400 $\mu g/ft^2$

This increases the ability of the screen to detect hazards. False positive results are possible, but since the lead hazard screen was designed as a negative screen, this outcome is acceptable.

Interpreting the Results

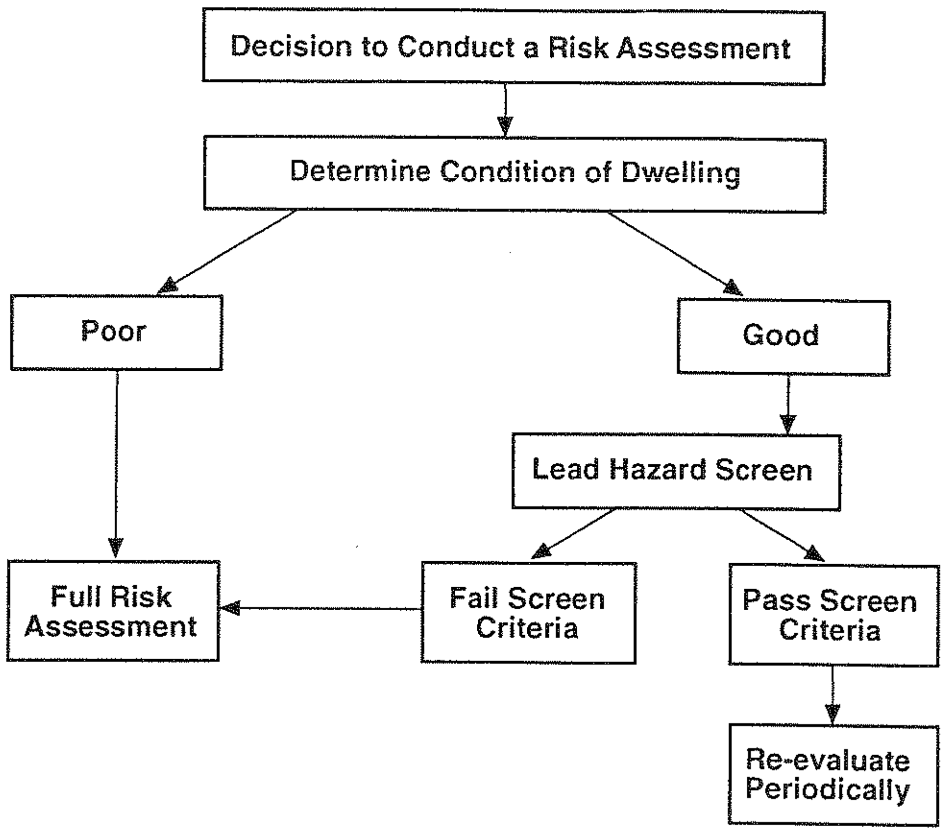
When the results of any of the dust or paint samples are above the standards listed above, the dwelling unit fails the lead hazard screen. The risk assessor should inform the owner that the lead hazard screen failed and that a full risk assessment is necessary. The risk assessor should also inform the owner that a full risk assessment report cannot be produced based on the lead hazard screen samples. A full report identifying all lead hazards and options for hazard control can only be generated if the full risk assessment protocols are followed.

When all sample results are below the lead hazard screen standards, the dwelling unit is considered to be free of lead-based paint hazards. Like the full risk assessment, a lead hazard screen is unable to determine whether a dwelling unit is lead-free. Only a full paint inspection can make this determination.

If a unit does pass the lead hazard screen, the risk assessor should provide the owner with documentation stating the date of the screen and the negative finding. The risk assessor should also provide the owner with a copy of the reevaluation schedule stating that the unit should be reinspected in 3 years. (Section 12 provides more detail about reevaluation schedules.)

In some instances the owner may request that the assessor complete a "certificate" of lead hazard status if the unit meets the local criteria for issuance of such documentation. Assessors should be careful to check that the results of the screen are sufficient to satisfy any local or insurance standards that permit the issuance of such a certificate.

Lead Hazard Screen Decision Logic



Key Concepts

Risk assessors should give owners of properties that are in good physical condition the option of having a lead hazard screen conducted.

The screen is designed to reduce the evaluation costs for the owner, while protecting the health of the residents.

The lead hazard screen should be considered a part of the risk assessment protocol.

The lead hazard screen acts as a negative screen. A unit may fail the screen but later be shown to be free of hazards.

If the screen passes, no further action is required.

If the results of the screen indicate that lead hazards may be present, then the risk assessor should conduct a full risk assessment.

A lead hazard screen begins with a visual inspection of all painted surfaces in a dwelling unit.

The risk assessor should collect one paint chip for each painted surface in poor condition.

If more than five surfaces have paint in poor condition, then the risk assessor should recommend that the owner proceed with a full risk assessment and/or a paint inspection.

The risk assessor should collect two composite dust samples from the dwelling unit: one from floors, one from troughs.

The standards for composite dust samples collected during a lead hazard screen are more stringent than the standards used during a full risk assessment.

If a unit passes the lead hazard screen, the risk assessor should provide the owner with documentation stating the date of the screen and the negative finding and recommended reevaluation interval(s).

SECTION 10

PROCEDURES FOR ASSESSING MULTI-FAMILY PROPERTIES

Learning Objectives

After completing this section, students should be able to

- understand both the challenges and opportunities afforded by multi-family properties;
- use the tables in the HUD *Guidelines* to determine how many similar dwelling units to sample in a multi-family housing development;
- define worst-case, targeted, and random sampling;
- state the four criteria to be used in developing a targeted sample;
- state four characteristics to be examined to determine if any given collection of dwellings is sufficiently similar;
- identify at least three ways owners should modify their management and maintenance systems to control lead-based paint hazards on an on-going basis;
- interpret sampling results and how to address inconsistent results or outliers;
- state at least three characteristics of a compliance plan that phases in hazard controls over a period of time to enable the owner to render the entire portfolio lead-safe according to specific schedules.

Introduction

Multi-family properties provide both advantages and challenges to the risk assessor. Because many similar dwelling units are present, only a few need to be sampled. This drives down the per unit cost of risk assessments substantially but makes proper selection of units crucial if the results are to be valid across the rest of the units not visited or sampled. In addition, many multi-family property owners have management and maintenance staffs and procedures. In some cases, staffs will require training. Management and maintenance systems (such as work orders) will need to be revised so that either immediate or potential lead-based paint hazards are accounted for. Finally, risk assessors can often help owners determine where to focus available resources for the greatest benefit by prioritizing responses according to a formal plan, which may have the benefit of reducing an owner's liability.

Performing risk assessments in multi-family housing involves the following steps:

- determining whether or not dwelling units are similar enough to allow sampling only a few of them;
- determining which sampling method (targeted, worst-case, or random sampling) is appropriate (targeted sampling is used most frequently in risk assessments);
- determining the number of units to assess;
- determining exactly which units to assess;
- conducting visual assessment and environmental sampling in selected units;
- calculating averages and examining data for outliers;
- determining if development- or building-wide lead-based paint hazards exist;
- if lead-based paint hazards do exist, devising hazard control plans for the specific owner, management company, maintenance staff, etc.;
- completing the assessment report.

Information Required to Determine Similarity of Dwellings

For an evaluation of a large number of rental dwellings, the assessor must gather information from the owner about the residents, the management company and/or staff, and the maintenance staff in order to assess confidently the viability of hazard control options. Therefore, the protocols for collecting information from owners of multiple dwellings are more extensive than the protocols for owner-occupants.

At the same time, owners with a large number of dwellings to be evaluated will be able to reduce the per unit costs of the risk assessment greatly. If, in the judgement of the risk assessor, the dwellings to be evaluated are sufficiently similar, the protocols allow the risk assessor to limit sampling to the dwellings that are most likely to present immediate lead hazards to residents. The environmental sampling from these targeted similar dwellings is used to represent the lead-based paint hazards in all dwellings. For the purposes of risk assessment, the term similar dwellings describes those dwellings that

- were built at the same time;
- have a common maintenance and management history;
- have a common painting history;
- are of similar construction.

Similar dwellings do not need to be contained in a single housing development or in a single building to meet this definition; they also need not have the same number of rooms or floor plans.

Risk assessments of five or more similar dwellings should include

- information from the owner (or owner's representative) about the condition of the property; the age and location of children in the property (if known); and the management and maintenance practices for the dwellings;
- the selection of dwellings for targeted, worst-case, or random sampling (targeted sampling is the best feasible method in most cases);
- a visual assessment of the condition of the building and painted surfaces in the targeted dwellings;
- environmental sampling of deteriorated paint, dust, and soil in the targeted dwellings (and common areas of multi-family developments).

Targeted, Worst-case, and Random Sampling

The criteria used in this section should be used by the risk assessor to identify specific dwellings to be sampled. If no hazards are identified in these units, then it is unlikely that the unsampled units will have hazards.

Targeted sampling relies on information supplied by the owner regarding condition, presence of children, and so on.

Worst-case sampling requires the risk assessor to physically walk through all of the dwellings in order to select the highest-risk dwellings based on visual evidence. Since entry into all dwellings units is often not feasible, targeted sampling is a good way of identifying high-risk units.

Random sampling is done when no information on the dwellings can be obtained to permit targeted or worst-case sampling.

Targeted Sampling

Targeted sampling selects dwellings that are most likely to contain lead-based hazards to represent the other dwellings. The sampling protocol assumes that if the selected dwellings are free of lead hazards, it is highly probable that the other similar dwellings are also free of lead hazards. Targeted sampling has been used in public housing risk assessments for several years. This sampling protocol reduces the cost of assessment and is unlikely to miss significant lead hazards.

Worst-case Sampling

Alternatively, the sampling of similar dwellings can be conducted with worst-case sampling. Worst-case sampling requires the risk assessor to conduct a walkthrough survey of all dwellings in a housing development in order to select the highest-risk dwellings. Worst-case sampling is not practical for most multiple dwellings, since it is nearly impossible to gain entry to all units in an expeditious fashion.

It is not possible for the risk assessor to quantify the degree of certainty associated with the findings using either targeted or worst-case sampling, since health-protective bias is present. However, if the risk assessor is conscientious about the proper selection of dwellings to be sampled (using the dwelling selection criteria), if there is confidence that the target dwellings meet the selection criteria and the dwellings meet the similarity criteria, then the risk in a given development can be characterized sufficiently.

The protocols in this course are based on targeted or worst-case sampling.

Targeted, Worst-case, and Random Sampling

Random Sampling

If the owner requires a statistically significant degree of confidence about the existence of lead-based paint hazards or if no information on the housing characteristics, maintenance, and management can be obtained, random sampling should be used. In the HUD *Guidelines* random sampling is recommended for lead-based paint inspections because the results are often used for developing more expensive, long-term hazard control measures. Random sampling in multi-family settings with more than 20 units usually requires more dwellings to be sampled and therefore may increase the cost of the risk assessment compared with targeted or worst-case sampling. See the random sampling table (7.3 from the HUD *Guidelines*) on the following page.

Selection of Sampling Strategy

Targeted sampling should not be conducted if the owner is unable to provide accurate information about the occupancy status and physical condition of the dwellings to be sampled. If it appears that this information is unavailable or is being concealed by the owner, the risk assessor should resort to random or worst-case sampling.

HUD Guidelines Table 7.3
Number of Units to be Tested in Multi-family Developments

Number of units in building or group of similar buildings	Number of units to be tested
21–26	20
27	21
28	22
29–30	23
31	24
32	25
33–34	26
35	27
36	28
37	29
38–39	30
40–50	31
51	32
52–53	33
54	34
55–56	35
57–58	36
59	37
60–73	38
74–75	39
76–77	40
78–79	41
80–95	42
96–97	43
98–99	44
100–117	45
118–119	46
120–138	47
139–157	48
158–177	49
178–197	50
198–218	51
219–258	52
259–299	53
300–379	54
380–499	55
500–776	56
777–1,004	57
1,005–1,022	58
1,023–1,039	59

For buildings or groups of similar buildings with 1,040 units or more, test 5.8% of the number of units, rounded to the nearest unit. Example: If there are 2,170 units, 5.8% times the number of units is 125.86, so 126 units should be tested.

Number of Dwellings to be Sampled

Table 5.6 in the HUD *Guidelines* describes the number of dwellings that are needed for targeted or worst-case sampling. Since at least four dwellings must be sampled, targeted sampling cannot be used for evaluations of fewer than five similar dwellings. When fewer than five similar dwellings are being evaluated, all units should be sampled.

HUD *Guidelines* Table 5.6
Minimum number of targeted or worst-case dwellings to be sampled among similar dwellings§
(random sampling will require additional units)

Number of similar dwellings	Number of dwellings to sample
1–4	All
5–20	4 units or 50% (whichever is greater)*
21–75	10 units or 20% (whichever is greater)*
76–125	17
126–175	19
176–225	20
226–300	21
301–400	22
401–500	23
500+	24 + 1 dwelling for each additional increment of 100 dwellings or less

§Does not include dwellings with children who have elevated blood lead levels.

*For percentages, round up to determine number of dwellings to be sampled.

Units Housing Children With Elevated Blood Lead Levels

When risk assessors are calculating the number of targeted dwellings, dwellings that are known to house children with elevated blood lead (EBL) levels should be excluded from the total. Elevated blood lead levels above 20 µg/dL (or a persistent 15 µg/dL upon repeated testing) require environmental investigations according to Guidelines from the Centers for Disease Control and Prevention. These investigations will generally be conducted by the public health agency within the jurisdiction of the dwelling. If, after consultation with the health department, it is agreed that the risk assessor will perform the investigation, the evaluation should use the protocol for dwellings housing children with elevated blood-lead levels (Chapter 16 of the HUD *Guidelines*, 1995, and Section 13 of this manual). This investigation should be completed in addition to the other units investigated as part of the normal risk assessment.

Since blood lead levels are confidential medical information, owners may not know whether children with elevated blood lead levels reside in their dwellings. Nevertheless, the risk assessor should request this information from the owner in order to try to better target the study. Owners and risk assessors must not pressure an occupant to divulge such information without full informed consent.

Number of Dwellings to be Sampled

Dwelling Selection Criteria

The selection criteria found here offer general guidance for selecting targeted dwellings. Risk assessors should obtain the information needed from the owner's records (if available) or through interviewing the owner. Targeted dwellings should meet as many of the following criteria as possible (criteria listed in order of importance):

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

If additional dwellings are required to meet the minimum sampling number specified in Table 5.6, the risk assessor should select them randomly.

If a number of dwellings all meet the same criteria, then the dwellings with the largest number of children under the age of six should be selected. This is based on the premise that children tend to cause increased wear and tear on painted surfaces. Therefore, dwellings where children reside are more likely to contain lead-based paint and dust hazards. When possible, at least one dwelling in the sample should have been recently prepared for reoccupancy (although it need not be vacant), since the repainting and other repairs that are often conducted during unit turnover can create a leaded dust hazard. However, the risk assessor should not sample only dwellings that have recently been cleaned and repainted, since this would not represent the conditions in the rest of the dwellings. If too many dwellings all meet the same criteria, the risk assessor should eliminate the required number randomly.

Random Sample Selection

Random selection of units is done in precisely the same way as for paint inspections. This process is covered in the EPA Lead-based Paint Inspector Course.

The risk assessor should document which of the criteria were used to designate the dwelling as a targeted unit on the field sampling forms.

Example of Targeted Dwelling Selection

A risk assessor is hired to conduct a risk assessment for 30 dwellings owned by a single property owner. Twenty-five of these dwellings are apartments in the same building; have similar construction and painting histories; and were acquired simultaneously. The other five were acquired from different owners at different times, have had little previous rehabilitation work, and have different construction styles. One of the 25 similar dwellings is known to house a child with an elevated blood lead level. The local health department has already informed the risk assessor that the department has no plans to evaluate the dwelling because of a staffing shortage.

In this case, the risk assessor will evaluate the following:

- five dwellings of different construction;
- one dwelling with the EBL child (using the protocols found in Chapter 16 of the HUD *Guidelines*);
- ten dwellings of similar construction (from Table 5.6, 24 total dwellings requires 10 dwellings to be sampled)

The risk assessor will conduct sampling in 16 dwellings, with the 10 targeted dwellings used to represent the 24 similar dwellings that do not house children with elevated blood lead levels.

For the 24 similar dwellings, the owner has provided the following resident information:

- six dwellings have three children under age six;
- three dwellings have two children under age six;
- five dwellings have one child under age six;
- nine dwellings have an unknown number of children;
- one dwelling is vacant and has recently been prepared for reoccupancy.

In addition, the owner has supplied the following resident use and maintenance information:

- two dwellings have building code violations (one with three children, one with one child);
- three dwellings have a history of chronic maintenance problems and are in relatively poor condition (two dwellings with an unknown number of children, one with two children);
- there are no known day-care facilities.

Example of Targeted Dwelling Selection

Based on this information, the risk assessor targets the following dwellings:

- two dwellings with building code violations (one with three young children);
- three dwellings rated in poor condition;
- one dwelling recently prepared for reoccupancy.

This yields six dwellings. The final four dwellings should be selected from among the five remaining similar dwellings that house three young children. Since there are no distinguishing factors among the five dwellings, the final four dwellings are selected randomly from this group.

Risk Assessments of Fewer Than Five Rental Dwellings and Multiple Dwellings That Are Not Similar

When evaluating fewer than five similar rental dwellings or multiple dwellings that are not similar, the risk assessor should assess each of the dwellings individually. The risk assessor will not be able to draw solid conclusions from a smaller sample. Current evidence from the public housing risk assessment program suggests that hazards in different single-family scattered site dwelling units vary greatly, unlike similar multi-family dwellings units where a clear pattern of hazards typically exists among dwellings. Therefore, all dwellings should be assessed.

When conducting risk assessments of a large number of dwellings that are not similar, the risk assessor must use professional judgment to determine whether there is a pattern of lead hazards among dwellings. If a clear pattern emerges once the process has begun, the risk assessor may not have to evaluate all dwellings.

The sampling method that should be employed is a modification of the targeted sampling model. The risk assessor should collect information about

- the condition of the building(s);
- the age and location of children in residence.

The risk assessor should then rank the dwellings based on the selection criteria listed previously. Next, the risk assessor should sample 25 percent of the total number of dwellings or 10 dwellings (whichever is greater). The risk assessor should choose the first group of dwellings to be sampled from the units thought to be at the highest risk. The risk assessor should evaluate the results to determine if a clear pattern of lead-based paint hazards can be discerned. If no clear pattern emerges, the risk assessor should sample additional dwellings until a pattern of hazard severity and location becomes apparent or until all dwellings have been sampled.

Example

A risk assessor evaluating 100 different dwellings selects a sample of 25 targeted dwellings. The risk assessor finds that all of the targeted dwellings have high leaded-dust levels in the window troughs but nowhere else. In this situation, the risk assessor may suggest to the owner that the window troughs in all 100 dwellings are likely to be contaminated and therefore should all be cleaned. The owner must decide whether to follow this recommendation or continue the risk assessment for additional dwellings. If the window troughs are all cleaned, the risk assessor should perform a combined clearance examination/risk assessment, which should reduce costs considerably.

Assessments of Fewer Than Five Similar Dwellings

When conducting evaluations of less than five dwellings, risk assessors may find that it is appropriate to modify the amount of information they request from owners. Owners of a small number of dwellings are likely to have a simplified management structure (e.g., the owner acts as both manager and maintenance worker). If this is the case, the risk assessor should shorten both the management and maintenance questionnaires.

For the small evaluations, the risk assessor may find it helpful to interview residents using the resident questionnaire. Risk assessors should notify residents that the questionnaire is optional, and risk assessors should not make more than one trip to the dwelling to collect the information. For large evaluations, the use of the questionnaire is not feasible.

Optional Analysis of Management and Maintenance Practices

Many forms of lead hazard control will require property management planning and careful maintenance work on surfaces that are known or suspected to contain lead-based paint. To help owners undertake these activities, risk assessors can collect information on how management and maintenance work is structured on a given property by using Forms 5.6 and 5.7 (see page 10-22 and beyond for instructions on using these forms). Information on these forms will help the risk assessor make practical recommendations on how maintenance work can be done safely for both workers and resident children. Analysis of management and maintenance practices is common in public housing risk assessments but is only recommended and not required for private housing.

A typical management and maintenance plan will consist of

- designation of person responsible for lead-based paint work;
- development of a written policy statement to be signed by the owner that empowers subordinates to conduct routine work in a lead-safe manner;
- training of key managers and maintenance workers;
- reconfiguration of work order forms indicating what control measures are needed for a specific job (respirators, containment, clearance sampling, etc.).

Additional Sampling in Common Areas and On-site Community Buildings Frequented by Children

In order for the risk assessor to determine accurately the possible hazards to which a child living in a multi-family development may be exposed, some additional sampling of other areas outside the dwelling should be conducted. Depending on the type of area/building involved, the additional sampling scheme will vary as discussed below. In all areas where additional sampling is conducted, paint condition should be noted and areas of deteriorated paint should be sampled.

Common Areas

When sampling low-rise buildings (four stories or less), the risk assessor should collect two additional dust wipe samples:

- one from the entry area floor, and
- one from the floor of the first-story landing of a common hallway or stairway.

If there is a hallway window that is frequently used, the risk assessor should collect an interior window sill or window trough sample from this window and substitute this sample for the floor sample from the first-floor landing.

In high-rise buildings, the risk assessor should also collect two additional dust samples from the corridor of every fourth floor. These dust samples should be collected from:

- floors areas
- window troughs.

If the window cannot be opened, or there is no trough present, the risk assessor should collect a sample from the interior sill instead.

In addition, two dust samples should be collected from stairways:

- one from the stair treads
- one from the landing.

When the risk assessor is collecting the dust samples, he/she should note the conditions of all painted surfaces in the areas where the samples are collected.

Additional Sampling in Common Areas and On-site Community Buildings Frequented by Children

On-site Community Buildings, Day Care, Recreational, or Other Spaces Frequented by Children

Since a child could spend a large portion in any of these types of facilities, taking dust samples in these spaces is recommended. The number of additional dust samples to take is dependent on the size of the space.

For spaces up to 2,000 square feet:

- **Floors**. The risk assessor should collect two dust samples from widely separated locations in "high-traffic" areas regularly used by or accessible to children.
- **Windows**. The risk assessor should collect two samples, one from an interior window sill and the other from a window trough.

For spaces over 2,000 square feet:

- **Floors**. The risk assessor should collect one additional sample for each increment of 2,000 square feet.
- **Windows**. The risk assessor should collect one additional sample of either an interior window sill or a window trough for each additional increment of 2,000 square feet.

In the building's management office, one dust sample should be collected from the floor of the resident waiting area (if children are ever present in the area); two samples should be collected if the area is more than 400 square feet. Dust samples may be composited according to the rules explained in Section 5 "Dust Sampling."

Interpreting Environmental Sampling Results

Dust and Soil

In some circumstances, environmental sampling results may fail to reveal a clear pattern in the units studied. This could be due to random chance or the fact that the units are in fact not sufficiently similar to permit confident sampling to be done.

When interpreting results in multi-family housing, the average of all dust and soil samples collected in a housing development is used to determine whether or not a development-wide lead-based paint hazard exists. If the average is below the applicable standard, but individual dwellings have conditions that constitute hazards, the hazards in those units should be controlled. Risk assessors should use professional judgement to determine if additional sampling is needed to characterize the variability within the housing development.

The risk assessor should calculate the following averages from the sample results for all dwellings assessed:

- average floor dust lead;
- average window sill dust lead;
- average window trough dust lead;
- average play area soil lead;
- average building perimeter soil lead.

If any of these averages exceeds the appropriate standard, a development- or building-wide lead-based paint hazard exists, unless a high average can be attributed to one or two outliers. Interpretation of outlier data is based on the professional judgment of the risk assessor.

If all averages are below the appropriate standard, no development- or building-wide lead based paint hazard exists.

Interpreting Environmental Sampling Results

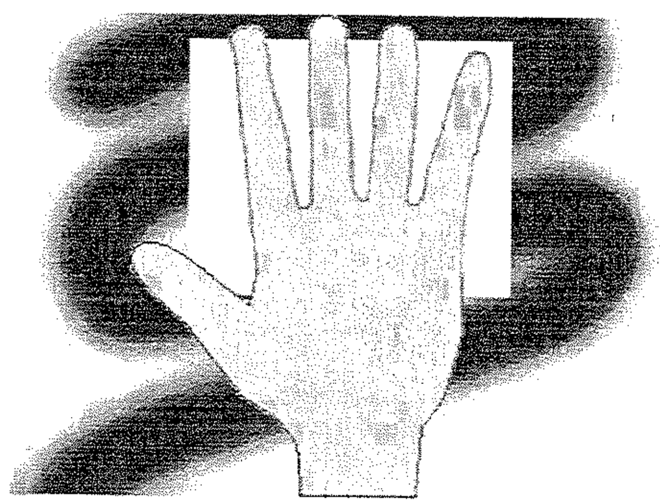
For example, if a risk assessor were to find the following lead dust levels in window troughs in three residences:

	25	µg/ft²
	30	
	25	
	40,000	
	29	
	50	
Total	40,159	µg/ft²

In this example, 40,000 µg/ft² is clearly an outlier that is inconsistent with the other data. The average of 6,639 µg/ft² is an inappropriate description of the data set. Further sampling might be done to confirm this conclusion. Even though the average is above standard, no development-wide lead-based paint hazard has been shown to exist in all three residences.

Average

```
     6,639
6 √ 40,159
    36
     41
     36
      55
      54
       19
```



Interpreting Environmental Sampling Results

Paint

If the risk assessor finds that deteriorated paint on a given component has lead above the standard, the owner has two choices:

- to treat all components of that type as if they have lead levels above the standard; **or**
- to request that the risk assessor conduct further sampling using the lead-based paint inspection protocol in Chapter 7 of the HUD *Guidelines*.

User Instructions for Form 5.6

The risk assessor should use Form 5.6 to evaluate the property owner's management capabilities in regard to lead-based paint hazard controls. The risk assessor should briefly explain the purpose and content of the form to the owner to make sure that the type and scope of information requested is understood. All of the information should be supplied by the owner or a representative of the owner, either in writing or through an interview.

Part 1 of Form 5.6 requests background information about the property and additional data about the physical condition of each dwelling and the number of young children in residence.

Part 2 requests information about the management of the dwellings.

1. Staffing

Determine which management and maintenance personnel (by name and job title) are charged with responsibility for dealing with lead-based paint hazards. This typically includes the owner, manager, director of maintenance, centralized maintenance staff, and site maintenance staff. The risk assessor can help the owner determine which staff positions could be involved in lead hazard control efforts and identify the key contact persons.

Smaller-scale multi-family housing is more likely to have a simplified management structure. Indeed, the owner may also act as manager and maintenance worker. If there is a division of labor between owner and manager or manager and maintenance worker, the risk assessor should attempt to determine who has the recognized authority to handle lead-based paint issues.

2. Lead Hazard Control Policy Statement (optional)

Determine if the property management has established a lead hazard control policy statement. If so, review the statement. If no statement exists, the risk assessor may help the owner draft such a statement as an indication of a good faith effort to control lead hazards. See the section on Management of Multiple Dwellings for a sample lead hazard control policy statement (page 5-37 in chapter 5 of the HUD *Guidelines*).

3. Previous Lead-based Paint Evaluations

Determine if previous lead-based paint testing has been completed. If so, obtain and review a copy of the report, using the criteria outlined in the section on Evaluating Previous Paint Testing.

4. Previous Lead Hazard Control Activity

Determine if previous lead-based paint abatement or hazard reduction has been completed. If so, obtain and review a copy of the report. Determine if clearance dust testing was completed following abatement.

User Instructions for Form 5.6

5. Turnover Procedure

Determine how a vacant dwelling is prepared for reoccupancy. For example, the method of cleaning used on dwelling turnover should be analyzed.

6. Employee Health and Safety Plan

Determine if the property management has an employee health and safety plan. Employees working with lead hazards are required by OSHA to be involved in a hazard communication program. After reviewing the current state of knowledge and hazard control practices, the risk assessor should help the owner develop site-specific management and maintenance plans.

7. HEPA Vacuum

Determine if a HEPA vacuum is available to clean up lead-contaminated dust.

8. On-site Day-care Facilities

Determine if the property management operates or permits the on-site operation of day-care facilities (either formal or informal). Also determine if there are on-site recreation halls or facilities operated by the owner that are frequented by young children. These spaces should be sampled by the risk assessor.

9. Management of Cases of Children with Elevated Blood Lead Levels

Determine if the property management has a plan to deal with children who have an elevated blood lead level. If necessary, the risk assessor should help the owner develop a plan.

10. Routine Inspections

If the owner or manager conducts periodic housing quality inspections, determine whether or not those inspections examine the condition of painted surfaces and could be used to identify lead hazards. The risk assessor will often recommend that the owner or manager conduct periodic inspections to ensure that lead hazard control treatments retain their effectiveness.

11. Code Violations

Determine if the dwellings have been cited for any housing code violations in the past several years. Dwellings that have been cited should be identified for targeted sampling.

12. Resident Notification

Determine if the owner has notified residents about known lead hazards at the property.

HUD *Guidelines* Form 5.6
Management Data For Risk Assessment of Lead-based Paint Hazards in Rental Dwellings (Optional)

NOTE: This form is designed for multiple rental dwellings under one ownership. Such dwellings may be in one property or many.

Part 1: Identifying information

Identifying information:

Name of property owner ______________________________

Name of building or development (if applicable) ______________________

Number of dwelling units________

Number of buildings______

Number of individual dwelling units/building ____

Date of construction (if one property) ________

Date of substantial rehab, if any ______

List of addresses of dwellings (attach list if more than 10 dwellings are present)

Street address, city, state	Dwelling unit no.	Year built	Number of children aged 0–6 years old	Recent code violation reported by owner?	Chronic maintenance problem reported by owner?

Record number and locations of common child play areas (onsite playground, backyards, etc.)

Number ____

________________ ________________ ______________

________________ ________________ ______________

________________ ________________ ______________

HUD *Guidelines* Form 5.6 (cont.)

Part 2: Management/Information

1. List names of individuals who have responsibility for lead-based paint. Include owner, property manager (if applicable), maintenance supervisor and staff (if applicable) and others. Include any training in lead hazard control work (inspector, supervisor, worker, etc.) that has been completed. Use additional pages, if necessary.

   This information will be needed to devise the risk management plan contained in the risk assessor's report.

Name	Position	Training completed (if none, enter "None")
		Owner
		Property manager
		Maintenance

2. Have there been previous lead-based paint evaluations?

   ______ Yes ______ No (If yes, attach the report.)

3. Has there been previous lead hazard control activity?

   ______ Yes ______ No (If yes, attach the report.)

4. Maintenance usually conducted at time of dwelling turnover, including typical cleaning, repainting, and repair activity.

   Repainting: ______________________________

   Cleaning: ______________________________

   Repair: ______________________________

   Other: ______________________________

   Comments: ______________________________

HUD *Guidelines* Form 5.6 (cont.)

5. Employee and worker safety plan

   a. Is there an occupational safety and health plan for maintenance workers?

   ______ Yes ______ No (If yes, attach plan.)

   b. Are workers trained in lead hazard recognition?

   ______ Yes ______ No

   If yes, who performed the training? ____________________________

   c. Are workers involved in a hazard communication program?

   ______ Yes ______ No

   d. Are workers trained in proper use of respirators?

   ______ Yes ______ No

   e. Is there a medical surveillance program?

   ______ Yes ______ No

6. Is a HEPA vacuum available?

   ______ Yes ______ No

7. Are there any onsite licensed or unlicensed day-care facilities?

   ______ Yes ______ No

   If yes, give location. __________________________

8. Planning for resident children with elevated blood-lead levels.

   a. Who would respond for the owner if a resident child with an elevated blood lead level is identified? ________________________________

   b. Is there a plan to relocate such children?

   ______ Yes ______ No

   If yes, where? ________________________________

   c. Do you (the owner) know if there ever has been a resident child with an elevated blood lead level?

   ______ Yes ______ No ______Unknown

9. Owner Inspections

   a. Are there periodic inspections of all dwellings by the owner?

   ______ Yes ______ No

   If yes, how often? _______________________

   b. Is the paint condition assessed during these inspections?

   ______ Yes ______ No

10. Have any of the dwellings ever received a housing code violation notice?

    ______ Yes ______ No ______ Unknown

    If yes, describe code violation. ____

11. If previously detected, unabated lead-based paint exists in the dwelling, have the residents been informed?

    ______ Yes ______ No ______Not Applicable

HUD *Guidelines* Form 5.7
Maintenance Data for Rental Dwellings

Recorded during onsite investigation.

1. Condition of paint on selected surfaces

Building component	Location Notes	Paint condition (intact, fair, poor, or not present) to be completed by risk assessor	Deterioration due to friction or impact	Deterioration due to moisture	Location of painted component with visible bite marks
Building siding					
Exterior trim					
Exterior windows					
Exterior doors					
Railings					
Porch floors					
Other porch surfaces					
Interior doors					
Ceilings					
Walls					
Interior windows					
Interior floors					
Interior trim					
Stairways					
Radiator (or radiator cover)					
Kitchen cabinets					
Bathroom cabinets					
Other surfaces					

If the overall condition of a component is similar throughout a dwelling, that condition should be recorded. If a component in a couple of locations is in poor condition but the overall condition is good or fair, the specific sites of the badly deteriorated paint should be noted. The specific locations of any component with bite marks should be recorded.

HUD *Guidelines* Form 5.7 (cont.)

2. Painting frequency and methods
   a. How often is painting completed? every _________ years
   b. Is painting completed upon vacancy, if necessary?
      ______ Yes ______ No
   c. Who does the painting? _______Property Owner _______Residents
      (If residents, skip to Question 2)
   d. Is painting accompanied by scraping, sanding, or paint removal?
      ______ Yes ______ No
   e. How are paint dust/chips cleaned up? (check one)
      ______ Sweeping ______ Vacuum
      ______ Mopping ______ HEPA/wet wash/HEPA cycle
   f. Is the work area sealed off during painting?
      ______ Yes ______ No
   g. Is furniture removed from the work area?
      ______ Yes ______ No
   h. If no, is furniture covered during work with plastic?
      ______ Yes ______ No
3. Is there a preventive maintenance program?
   ______ Yes ______ No
4. Describe work order system (if applicable, attach copy of work order form).
   ____
   ____
   ____
5. How are resident complaints received and addressed? How are requests prioritized? If formal work orders are issued, is the presence or potential presence of lead-based paint considered in the work instructions?
   ____
   ____
   ____
6. Record location of dwellings recently prepared for reoccupancy.
   _______________ _______________ _______________

Key Concepts

Similar multi-family housing for lead-based paint risk assessment purposes is defined as housing that:

- was built at the same time;
- has a common maintenance and management history;
- has a common painting history;
- is of similar construction.

Targeted sampling is the recommended, most practical method of characterizing lead-based paint hazards in a multi-family housing project.

Targeted sampling is the selection of dwellings most likely to have lead-based paint hazards based on:

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

Worst-case sampling involves a risk assessor's walkthrough survey of all dwellings in a housing development, followed by a visual selection of the worst-case units for environmental sampling.

Random sampling is done by the risk assessor when no information about the dwellings is available, using the procedure for lead-based paint inspections described in the EPA inspector course.

Risk assessments in multi-family housing with fewer than five units or in multiple single-family homes that are not similar should include sampling all units (unless a clear pattern emerges from partial sampling).

The risk assessor may help the owner develop a management plan to help prioritize hazards and ensure that routine maintenance work does not cause lead-based paint hazards.

Key Concepts

The four main elements of such a plan include:

- designation of person responsible for lead-based paint work;
- development of a written policy statement to be signed by the owner that empowers subordinates to conduct routine work in a lead-safe manner;
- training of key managers and maintenance workers;
- reconfiguration of work order forms indicating what control measures are needed for a specific job (respirators, containment, clearance sampling, etc.).

Individual units that have lead-based paint hazards should be corrected.

Additional dust and/or soil samples should be taken in common areas and onsite community buildings frequented by children. Paint condition in these areas/facilities should be noted, and if deteriorated, sampled.

The risk assessor should calculate the following averages from the sample results for all dwellings assessed:

- average floor dust lead;
- average window sill dust lead;
- average window trough dust lead;
- average play area soil lead;
- average building perimeter soil lead.

If any of these averages exceeds the appropriate standard, a development- or building-wide lead-based paint hazard exists, unless a high average can be attributed to one or two outliers. Interpretation of outlier data is based on the professional judgment of the risk assessor.

If all averages are below the appropriate standard, no development- or building-wide lead based paint hazard exists.

SECTION 11

Developing Hazard Control Option Plans

Learning Objectives

At the end of this section, students should be able to:

- define the final product of a risk assessment;
- define the key difference between interim controls and abatement;
- name the four main types of interim controls;
- name the six main types of abatement;
- name the four types of regulated activities that should accompany any hazard control effort;
- name the five steps for paint film stabilization;
- name two advantages and two disadvantages of each interim control and abatement method;
- name five construction materials commonly used to enclose surfaces with lead-based paint;
- name the three accepted methods of paint removal;
- name the three factors that help prolong the effectiveness of encapsulation so that it qualifies as an abatement method;
- state the levels of bare soil contamination at which the EPA recommends abatement;
- state the levels of bare soil contamination in play areas at which the EPA recommends some form of soil treatment;
- name the three methods of paint removal prohibited by HUD;
- name the two methods of paint removal not recommended by HUD; and
- name the five situations when interim controls should not be recommended.

Introduction

The final product of the risk assessment is a report containing a workable lead hazard control plan. The plan will include a list of the lead hazards found in the dwelling unit (if any) and the control options that can be used for that specific property. In identifying the options, risk assessors should take into account both the lead hazards that are present at the dwelling unit and the owner's needs and resources. While the final decision about what action to take is up to the owner, the risk assessor will often play a prominent role in the decision making process.

Lead-based paint hazard controls generally fall into two categories: interim controls and abatement. Interim controls (sometimes referred to as in-place management action) are viewed as short term measures to control the lead hazards, while abatement is a "permanent" solution. "Permanent" means any treatment that has an expected design life of at least 20 years.

General Description of Hazard Control Measures

Interim controls are measures designed to temporarily reduce human exposure or possible exposure to lead-based paint hazards. These measures include specialized cleaning, repairs, maintenance, painting, temporary containment, and educational programs for management and residents. Interim controls also include all preparation, cleanup, disposal, and post-abatement clearance testing activities associated with such measures.

The interim control measures include:

- paint film stabilization;
- friction and impact reduction treatments;
- dust removal; and
- soil covering using non-permanent means (e.g., grass, mulch, gravel).

Abatement is a measure or measures designed to permanently eliminate lead-based paint hazards. These measures include the removal of lead-based paint and lead contaminated dust, the permanent enclosure or encapsulation of lead-based paint, the replacement of lead-painted surfaces and fixtures and the removal or permanent covering of lead contaminated soil. Abatement also includes all preparation, cleanup, disposal, and post-abatement clearance testing activities associated with such measures.

Abatement measures include:

- building component replacement;
- enclosure;
- paint removal by heat gun, chemical, or contained abrasive;
- encapsulation (with patch tests and a 20 year warranty);
- permanent soil covering (paving); and
- soil removal and replacement.

The table on the following page compares these two families of control measures.

Table 11-1
Comparison of Interim Control and Abatement Methods

Characteristic	Interim Controls	Abatement
Likely duration of control measure	short term measure	permanent measure (at least 20 years)
Ongoing monitoring*	necessary in all situations	limited or no monitoring depending upon action taken
Certified abatement contractor required	no, but OSHA requires that all workers be trained	yes, EPA standards will require certified abatement supervisors and trained workers
Federal standards for lead hazard control work	HUD standards may apply to work done in some federally assisted housing	yes, EPA standards will require that certain work practices be met
Cost	typically less initial cost than abatement, but greater ongoing monitoring costs	typically greater initial costs than interim controls, but fewer follow-up costs

* Section 12 discusses ongoing monitoring requirements in more detail.

The EPA and HUD are currently developing federal standards that will include:

- training of abatement workers and certification of abatement supervisors;
- containment measures to protect occupants and workers from lead hazards;
- work practices to protect workers and satisfy OSHA standards;
- waste management procedures; and
- clearance dust testing to document that no lead-based paint hazards remain at the conclusion of work and cleanup.

The proposed rule describing these abatement standards was published on September 2, 1994 in the *Federal Register* (59 FR 45872). The final rulemaking is expected in 1995. States will have two years in which to adopt a program equally as protective as the federal standards, after which time the EPA will enforce the federal standards.

Interim Controls

This section briefly describes each of the interim control methods, noting their key advantages and disadvantages. This information is intended as an introduction only. More specific listings of recommended actions for given hazards appear later in this section.

Paint film stabilization

Paint film stabilization repairs deteriorated paint and creates a new, intact painted surface. The five key steps of paint film stabilization are:

- completion of any prerequisite repairs to control existing moisture or substrate problems (see Section 4 for a description of common sources of moisture and appropriate repairs);
- removal of all loose surface material through wet scraping or wet sanding;
- elimination of surface contaminants (which can prevent adhesion of new paint) through cleaning and deglossing; this procedure could include the following steps:
    - chemical degreasing or HEPA vacuum assisted sanding;
    - washing with trisodium phosphate or equivalent detergents;
    - thorough rinsing to remove efflorescence (salts);
- application of paint using an appropriate primer;
- application of topcoat paint from the same manufacturer.

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. These practices are discussed later in this section.

Advantages of paint film stabilization

- Its cost is typically low.
- It can be done by unskilled (but trained) workers.

Disadvantages of paint film stabilization

- It is not appropriate when substrate is severely damaged or unsound.
- It is not appropriate in high wear areas (e.g., children's play equipment) where deterioration will likely recur.
- Repairs may create lead contaminated dust which requires containment and thorough cleanup.
- Ongoing monitoring is essential.

Friction/Impact Surface Treatment

Friction surfaces can be treated either by covering the surfaces with an abrasion resistant material to eliminate the friction 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 (e.g., new shoe molding in front of baseboards; new chair rail to protect lead-based painted walls from jolts by the backs of chairs). Impact surfaces can also be covered with an impact resistant material (e.g., corner molding over outside corners of walls). Door stops can be replaced.

Advantages of friction/impact surface treatment

- It is less costly than component replacement.
- Dust generation is effectively controlled with appropriate ongoing monitoring.

Disadvantages of friction/impact surface treatment

- Knowledge of construction techniques is required.
- Extensive containment is needed to control dust generation for certain procedures (e.g., repairing windows).

Interim Controls

Dust Removal

Dust removal involves extensive and specialized cleaning. In general, it is most effective if the surfaces are "cleanable" (i.e., smooth and intact, thus making dust accessible for cleaning). Dust removal is performed when dust lead levels are above applicable standards and after the source of dust has been controlled.

Cleanup (including dust removal) and dust clearance are **always** completed at the conclusion of all interim controls or abatement measures. 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).

In general, a combination of HEPA vacuuming and wet washing with an appropriate cleaning agent is the recommended dust removal procedure. For upholstered furnishings, HEPA vacuuming alone is appropriate. Rugs can be sent out to be cleaned.

Advantages of dust removal

- It generally does not require specialized equipment (except for HEPA vacuum).
- It can be completed relatively quickly and effectively.
- It directly reduces occupant exposure to leaded dust.

Disadvantages of dust removal

- It is effective only if surfaces are smooth and cleanable (if a floor surface is not smooth or intact, it will require the application of an appropriate sealer, covering, and/or repair, such as polyurethane, vinyl, or linoleum).
- It will not be effective at keeping dust levels below applicable standards over the longer term if the source of the dust is not controlled.

Examples of non-smooth floor surfaces are: floor sheet goods with worn areas and tears; wood floors with gaps, cracks, splinters and areas with no sealant coating; unsealed concrete floors; and replacement flooring with no finish treatment.

Abatement

This section briefly describes each of the abatement methods, noting their key advantages and disadvantages. This information is intended as an introduction only. More specific listings of recommended actions for given hazards appear later in this section.

Building Component Replacement

Building component replacement consists of the removal of doors, windows, trim and other building items that are coated with lead-based paint and replacement with new lead-free components. This measure is appropriate when the component is mostly depreciated, since interim control measures are unlikely to be effective on unsound components (e.g., rotted window sashes, doors, etc.).

Advantages of building component replacement

- It creates a permanent solution by removing all lead-based paint.
- It minimizes dust contamination of the property.
- It minimizes worker and resident exposure to leaded dust.
- It allows for the upgrade of old building systems (e.g., installing new, energy efficient windows).
- It can be combined easily and inexpensively with renovation and remodeling work (thereby keeping costs low).

Disadvantages of building component replacement

- It is relatively expensive, particularly for historic preservation projects, as new building components may have to be customized to match the originals.
- In some historic preservation projects, building component replacement may not be permitted.
- It can generate large amounts of waste that, depending upon applicable requirements, may require hazardous waste disposal, which is costly and complicated.
- When trim removal reveals an opening, large amounts of dust can be released.

Abatement

Enclosure Systems

Using enclosure systems consists 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 as follows.

Appropriate enclosure materials

Surface/location	Covering material
Interior finish	Drywall, paneling, wainscot
Exterior finish	Aluminum, vinyl siding
Exterior trim	Aluminum or vinyl coil stock
Steps	Vinyl or rubber tread and riser coverings
Floors	Underlayment and vinyl or other sheet finish goods

Advantages of enclosure

- It allows the use of standard, locally available construction materials.
- It is highly reliable and may be more durable than encapsulation, as no federal standards currently exist to evaluate the reliability of an encapsulant (Note: Massachusetts has recently adopted encapsulant standards and Title X requires the federal government to also develop such standards.).
- It produces minimal waste, reducing the need for hazardous waste disposal.
- It generates minimal levels of lead contaminated dust.

Disadvantages of enclosure

- It does not permanently remove lead-based paint (it only makes the dwelling free of lead-based paint hazards).
- Enclosures are vulnerable to water and physical damage (e.g., holes punched in drywall).
- Future renovations can result in exposure to surfaces with lead-based paint and create lead-based paint hazards (note: it is important to label surfaces that have lead-based paint before they are enclosed).
- It cannot be used on unsound structures (soft, moveable or otherwise unsound structural components should be repaired prior to enclosure if the materials are needed to support the enclosure) (See the discussion in this section on moisture and water problems.).
- Because any enclosure can be breached, enclosures should be monitored at least annually by the owner.
- Aluminum or vinyl exterior siding can conceal rotting wood.

Abatement

On-Site Paint Removal

On-site paint removal consists of the on-site separation of paint from the substrate using a variety of methods (see Chapter 12 of the HUD *Guidelines*). Appropriate removal methods include:

- heat guns (for limited areas only)
- mechanical removal (HEPA sanding, wet scraping, HEPA vacuum blasting, HEPA vacuum needle gun)
- chemical removal

Advantage of on-site paint removal

- It can be less costly than replacing or enclosing building components.

Disadvantages of on-site paint removal

- Significant amounts of lead dust may be released.
- Hazardous waste typically is generated.
- Workers may be exposed to caustic chemicals and/or leaded dust.
- Chemical stripping can leave lead residues.
- Certain mechanical removal methods are not effective on certain substrates.
- Specialized equipment is needed for certain mechanical removal methods.

Off-Site Paint Removal

Off-site paint removal consists of removing paint through chemical or other means at a facility not on the abatement site (e.g., chemical stripping/dipping operations).

Advantages of off-site paint removal

- It has a low reevaluation failure rate.
- It is appropriate for historic preservation (depending upon the specific method used).
- The abatement contractor and owner generate minimal waste (the off-site facility generates most of the waste).
- Minimal ongoing monitoring is needed (compared to interim controls).

Disadvantages of off-site paint removal

- It can be expensive.
- It may deteriorate glues or other elements of components which may cause components to disintegrate.
- It does not remove lead from 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 lead-based 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.

HUD *Guidelines* require three criteria to be met in order for encapsulants to qualify as an abatement method (pending the development of a final federal standard):

- the manufacturer must provide a 20 year warranty on the effectiveness of the product;
- the property owner or local agency must conduct visual monitoring at one and six months after application to be sure the encapsulant is still intact;
- certified risk assessors must approve of the use of the encapsulant on-site for a specific surface, including completing a patch test on each surface to be encapsulated.

Advantages of encapsulation

- Lead dust is not generated (if surface preparation is minimal).
- It may be less costly than some other abatement methods (e.g., component replacement or paint removal).
- A wide range of encapsulation products is available to meet different needs.

Disadvantages of encapsulation

- 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.
- It may not be applied in extremely hot or cold weather conditions.

Soil Treatments

Different technologies to treat contaminated soil are currently under development. Risk assessors may find it useful to check with local environmental officials to learn which methods are considered most effective in a given geographical area.

Covering Bare Lead Contaminated Soil — Interim Controls

Covering bare soil that has been contaminated with lead prevents access to the contamination by either:

- providing temporary covering of contaminated bare residential soil with grass, gravel, mulch, or similar materials; or
- establishing land use controls (e.g., fences, thorny bushes, decks) to prevent access to the contaminated soil.

Both measures must be monitored regularly to ensure that the cover or controls remain viable. In most instances, additional materials will need to be added over time to retain the cover.

EPA guidance does not recommend interim controls or abatement when bare residential soil lead concentrations are below 400 µg/g. EPA guidance recommends that soil interim controls be used when:

- soil lead levels are from 400 µg/g to 5,000 µg/g and children are likely to have contact with such soil; or
- soil lead levels are from 2,000 µg/g to 5,000 µg/g, but children are unlikely to have much contact with the contaminated soil.

If soil lead levels exceed 5,000 µg/g, the EPA recommends that abatement, and not interim control measures, be pursued. The chart on the following page is excerpted from EPA's guidance and summarizes the EPA's recommended responses to lead-contaminated soil.

Advantages of interim covering of contaminated soil

- These measures typically require a lower initial investment than abatement measures (paving or soil removal/replacement).
- It does not require specialized contractor skills or equipment.
- If monitored regularly, it can be effective at reducing contact with (and hence exposure to) lead contaminated soil.

Disadvantages of interim covering of contaminated soil

- Barriers and covering can be easily disturbed or removed.
- It requires continuous monitoring.
- Extreme weather conditions can make it difficult to maintain covering (particularly grass, bushes, and other plantings).

Permanent Covering of Bare Lead Contaminated Soil — Abatement

This method consists of permanently covering bare, lead contaminated soil with concrete, asphalt, or other permanent materials. The EPA guidance recommends abatement when soil lead levels exceed 5,000 µg/g.

Advantages of permanent covering of contaminated soil

- It is a permanent solution to contaminated soil, providing that the source of lead in the soil (e.g., leaded gasoline, nearby point source, deteriorated exterior lead-based paint) has also been controlled.
- It does not generate waste.
- It is less costly than removal and replacement of soil.

Disadvantages of permanent covering of contaminated soil

- It is not appropriate for certain land uses (backyards, sandboxes).

Soil Treatments

Removal and Replacement of Bare Lead Contaminated Soil — Abatement

This procedure 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 (known not to contain hazardous levels of lead) in its place. EPA guidance recommends abatement when soil lead levels exceed 5,000 µg/g.

Advantage of removal and replacement

- It permanently removes the source of the lead in soil by taking it off-site.

Disadvantages of removal and replacement

- The removed soil must be tested using the TCLP to determine if it is a hazardous waste (anecdotal experience suggests that soil with total (not leachable) lead concentrations exceeding 3,500 µg/g are likely to fail the TCLP, requiring expensive hazardous waste disposal. The converse is not necessarily true since lead compounds have different potentials to leach using the TCLP test.).
- It can generate lead dust if not contained.

Prohibited or Not-Recommended Hazard Control Practices

The risk assessor should inform the owner of work practices that should be avoided. The list of activities found below include:

- paint removal practices that are either prohibited or not recommended in the *HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing;*
- settings in which interim controls are generally not appropriate.

HUD chose to ban or not recommend these methods because they create excessive lead dust and because alternative methods are available that are effective and less expensive. Thus, even if the listed methods are not banned in a given locality, risk assessors should not recommend using them.

Lead Hazard Control Practices Prohibited by HUD

Open-flame burning or torching. Open torches, infrared scorchers, electric irons, and heat guns operating above 1,100° F all may cause the release of lead fumes, which can poison workers. The fallout from the volatilized lead can also be very difficult to clean up. Heat guns operating below 1,100° F are acceptable, although they are recommended only for small areas.

Machine sanding or grinding without HEPA vacuum exhaust equipment. Circular, reciprocating, belt, and palm sanding of leaded surfaces can generate a large amount of leaded dust. Sanders and grinders should not be used unless the release of dust is controlled by the use of HEPA vacuum exhaust equipment attached to the tool.

Abrasive blasting or sandblasting without HEPA vacuum exhaust equipment. Like sanders, abrasive blasters will release a large amount of leaded dust into the environment unless HEPA vacuum local exhaust equipment is used.

Uncontained hydroblasting or high-pressure washing. Power washing often leaves leaded paint chips and dust on soil and exterior pathways. Hydroblasting should not be used unless all runoff will be contained and filtered.

Lead Hazard Control Procedures Not Recommended by HUD

Dry scraping/sanding (except for limited areas). Extensive use of dry scraping or sanding generates a significant amount of leaded dust which is hard to contain. Surfaces should be wetted prior to scraping/sanding so that the dispersal of dust is limited. Of course, some areas, such as surfaces near electrical circuits, should not be wetted.

Methylene chloride paint strippers. Methylene chloride can cause liver and kidney damage and carbon monoxide poisoning, and it is suspected to cause cancer. Air-purifying respirators with organic vapor cartridges do not provide adequate protection. (If respirators are required, they must be of the supplied-air or self-contained variety.) If chemical paint removers will be used, they should not contain methylene chloride and should preferably be used off-site.

Risk assessors should also become familiar with state and local laws and regulations that may affect available options. For example, in some states, the cleaning agent trisodium phosphate (TSP) is banned because of its potential threat to water habitats.

Prohibited or Not-Recommended Hazard Control Practices

When to Avoid Interim Controls

Risk assessors should avoid identifying interim controls as an option when any of the following conditions exist.

The property owner is subject to a court order and/or federal/state/local requirement of "abatement" of lead-based paint. In these cases, permanent abatement measures and not interim controls are required.

The underlying structure is unsound due to moisture or other factors, and the underlying problems will not be repaired. Interim controls address the outermost layer of any surface and do not treat moisture or structural problems that can affect paint condition. Therefore, risk assessors should not identify interim controls as an option to stabilize deteriorated paint unless the causes (other than wear) of the deterioration (e.g., water leaks, moisture, structural cracks) have been fixed. Underlying substrate, moisture, or structural problems will likely cause the paint to deteriorate again.

The building component requiring treatment is rotted or otherwise unsound. Risk assessors should not identify interim controls as an option to treat friction or impact surfaces (e.g., rehanging a door, covering a window sill or installing new tracks, covering a porch floor) if the wood is rotted or metal is rusted and will fall apart in a short time. One rule of thumb is that if more than 75 percent of the component is deteriorated, interim controls to stabilize paint or otherwise control a hazard are inappropriate, and the item should be replaced.

Bare residential soil lead levels exceed 5,000 µg/g. At this extreme level, EPA recommends that abatement (permanent covering such as paving, or soil removal and replacement) and not interim controls (temporary covering) be pursued.

Prohibited or Not-Recommended Hazard Control Practices

The property has a poor maintenance history that is unlikely to change. Interim controls require regular upkeep; as a result, they are unlikely to succeed without good maintenance. If the property owners' track record indicates that they are unable to maintain the building/unit in good condition (e.g., free of peeling paint, no fundamental structural problems, basic systems working — heat, plumbing), risk assessors should not recommend interim controls unless significant changes in maintenance and management practices will occur. In this case, risk assessors will need to judge if an owner can provide effective maintenance services. The HUD *Guidelines* provide a checklist (see Forms 5.6 and 5.7).

Priority Attention For Immediate Hazards

Most owners want to know what they need to do about lead problems in their house/unit. In responding to this question, risk assessors should identify all lead-based paint hazards in the unit and, whenever possible, call the owners' attention to hazards that pose the greatest potential risk to children. This type of priority setting is particularly important, as owners who do not have enough money to abate all hazards immediately will benefit from some advice on which hazard controls to undertake first. Without guidance from a risk assessor, an owner may choose to undertake lead hazard control actions that do not reap the greatest benefits to occupants (particularly children). Risk assessors should be careful, however, in how they present these "immediate hazards" to avoid giving the property owner the impression that the other hazards can be ignored. **The risk assessment report should clearly state that all lead-based paint hazards should be corrected.** At the same time, the report might state which hazards should be controlled first (e.g., hazards in play areas are more important than hazards in less-frequently contacted areas).

The following lead-based paint hazards are considered to be priority problems because dangerous levels of leaded dust (a major pathway of lead poisoning) or evidence of direct contact (mouthing) of lead covered surfaces exists. It is in these cases that children are most likely to ingest lead, resulting in elevated blood lead levels. The risks from such lead hazards is further increased if the hazards are present in the bedroom or play area of a child under six years of age. Risk assessors should use this information as general guidance in structuring hazard control plans, recognizing that site specific information may lead to different conclusions.

Immediate Lead-Based Paint Hazards

Lead dust exceeding federal standards. Current EPA/HUD guidance recommends the following dust numbers:

floors	100 µg/ft^2
interior window sills	500 µg/ft^2
window troughs	800 µg/ft^2

Flaking, peeling, chipping or otherwise delaminating lead-based paint

Floors or stairs with deteriorated lead-based paint

Tooth marks on surfaces covered with lead-based paint

Lead soil levels in bare soil exceeding 400 µg/g in children's play areas (e.g., sandbox, digging areas, under swing sets)

Activities Accompanying Lead Hazard Control Work

When risk assessors identify available options for hazard control, they should be sure to tell property owners about other activities that occur as part of abatement or interim controls. These activities, which vary depending on the specific hazard control method, include:

- clearance testing;
- occupant protection;
- worker protection;
- waste management;
- ongoing monitoring of hazard control measures.

Clearance Testing

Clearance testing is completed to ensure a unit is free of lead-based paint hazards once cleanup has been done and hazard control activities are completed. It involves:

- a visual examination to determine that hazard control measures are complete and no new lead-based paint hazards exist;
- dust sampling (and possibly soil sampling in the case of exterior work) to verify that levels are below applicable standards.

Federal regulations will likely require that clearance testing occur at the conclusion of all abatement procedures. Some HUD programs likely will also require clearance after interim controls. Risk assessors should note these requirements when describing an interim control or abatement method.

Risk assessors should discuss with owners the advantages of conducting a clearance test at the conclusion of the hazard control work to verify that the unit is free of lead-based paint hazards. Clearance testing is especially important when occupants are relocated during the work. The owner should make sure that the occupants do not return to a unit where dust or paint hazards still exist. Some insurance companies and states may also require clearance testing in some or all circumstances to document that the work has been done correctly and that occupants are returning to a unit free from lead hazards.

Activities Accompanying Lead Hazard Control Work

Occupant Protection

Care should be taken to ensure that occupants are protected during hazard control measures. Occupants can be at great risk of lead poisoning by remaining in the work area when the hazard control is occurring, because most such work typically generates leaded dust and paint chips.

Risk assessors should strongly recommend that occupants vacate the unit prior to the work beginning. During work, all belongings in the dwelling should be covered to prevent contamination with leaded dust. Occupants should not return to the unit until it has passed dust clearance testing and is thus free of lead-based paint hazards. Current EPA/HUD guidance has set such dust clearance levels at:

- floors — 100 µg/ft^2;
- window sills — 500 µg/ft^2;
- window troughs — 800 µg/ft^2.

If occupants cannot be relocated, then the following precautions should be taken at a minimum:

- furniture and other belongings should be removed from the work area if possible (if not, they should be covered with poly and tape);
- the work area should be sealed off from living spaces with poly and tape;
- a bathroom and kitchen outside the work area should be available for occupant use;
- waste should be stored in secure areas;
- all worker entry and exit routes should be sealed off from the remainder of the unit with poly and tape;
- the work area should not be unsealed until it passes clearance testing.

Risk assessors should consult HUD regulations for more specific requirements in federally assisted housing.

Worker Protection

OSHA's interim final regulation on lead in the construction industry prescribes requirements for lead hazard control workers. The HUD guidelines include a detailed discussion of how to apply this standard to residential work.

Activities Accompanying Lead Hazard Control Work

Waste Management

Risk assessors should consider the waste management costs associated with each hazard control measure when identifying potential options. Hazardous waste management costs are roughly ten times that of solid non-hazardous waste and thus can significantly increase the costs of a selected method. The following chart identifies the categories of abatement waste that can be produced during hazard control projects.

Table 11-2
Categories of Abatement Waste

Category	Description	Examples of wastes
I	Low lead waste (likely nonhazardous)	Filtered personal and commercial washwater Disposable personal protective clothing (HEPA vacuumed before disposal) Plastic sheeting cleaned prior to disposal (misted and wiped) and carpeting Waste that is determined to be nonhazardous by TCLP testing and is not an EPA-listed hazardous waste
II	Architectural components	Painted finish carpentry items, for example: • doors • windows • window trim and sills • baseboards • railing • moldings Other painted building components, for example: • metal railings • radiators • walls • stone or brick
III	Concentrated lead waste (likely hazardous)	Sludge from paint stripping Lead-based paint chips and dust HEPA vacuum debris and filter Unfiltered wash water Wastes testing as hazardous waste Wastes included on EPA's list of hazardous waste
IV	Other waste	Material that cannot be determined, using knowledge of the waste, to be categorized hazardous or nonhazardous waste. Waste must be tested using the TCLP to determine if it is hazardous.

Activities Accompanying Lead Hazard Control Work

Ongoing Monitoring of Hazard Control Measures

Both interim control and abatement measures should be monitored on a regular basis to ensure that they are still intact and that lead-based paint hazards have not reappeared. In general, interim controls require more frequent monitoring than abatement since they are designed as short term measures. Only units that have undergone a complete unit abatement or are free of lead-based paint should be exempted from ongoing monitoring. See Section 12 of this manual for additional information.

Hazard Control Options Reference Charts

This section presents a series of tables identifying hazard control methods that are technically feasible and perhaps cost-effective for a given lead-based paint hazard. The options presented, while frequently used strategies, are **not** the only choices available. In the tables, all painted surfaces are assumed to be painted with lead-based paint.

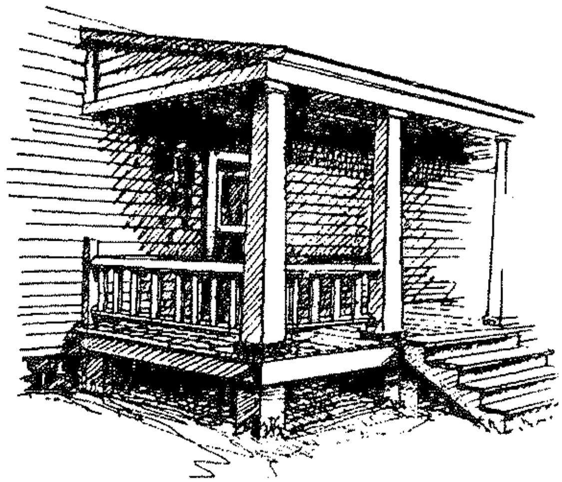
Risk Assessors' Menu of Available Hazard Control Options

Treatment option	Certified abatement contractor required	Dust[1] on floor	Dust[1] on windows	Paint[1] on doors	Paint[2] on windows	Paint[2] on floor, walls	Paint[2] on trim	High soil lead levels
Dust removal		✓	✓	✓	✓	✓	✓	✓
Paint film stabilization				✓	✓	✓	✓	
Friction reduction treatments		✓	✓	✓	✓		✓	
Impact reduction treatments		✓	✓	✓			✓	
Planting grass/sod covering with mulch, etc.		✓						✓
Encapsulation	✓					✓	✓	
Enclosure	✓					✓	✓	
Paint removal by heat gun[3]	✓			✓	✓		✓	
Paint removal by chemical[3]	✓			✓	✓	✓	✓	
Paint removal by contained abrasive[3]	✓			✓	✓	✓	✓	
Building component replacement	✓			✓	✓	✓	✓	
Soil paving	✓	✓						✓
Soil removal and replacement	✓	✓						✓

1 Lead contaminated dust
2 Deteriorated lead-based paint
3 Limited areas only

This chart identifies **all** available hazard reduction options. The following reference tables on individual hazards identify **frequently used** methods and may not always list all the methods shown on this summary chart.

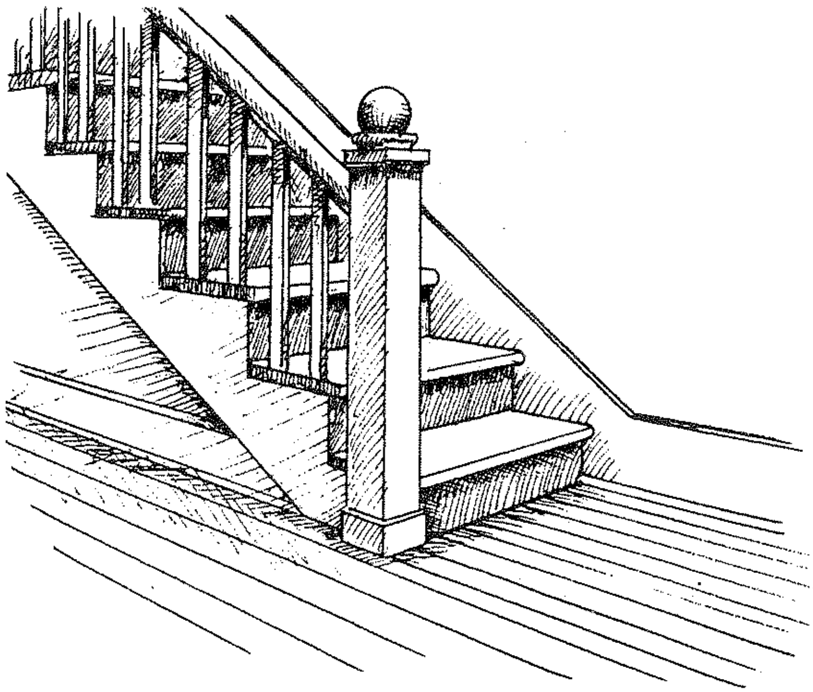
Interior or Porch Trim
(baseboard, chair rail, wainscot, crown, balustrades, newel post, stringer, casing)



	A	B	C
Condition	Surface coat paint failure	Peeling paint through many layers or to substrate	Chips out of surface, particularly convex and outside corners (e.g., window stools, outside corners)
Potential cause	Poor surface preparation	Moisture (from exterior or interior)	Impact
Prerequisite repairs		See section on moisture problems and solutions (Section 4)	
Control option 1	Stabilize paint (wet scrape and repaint)	If in small areas, wet scrape and repaint	Enclose impact edge or protruding surface, e.g., corner molding on outside corners and lattice nailed to long protruding surfaces*
Control option 2	Encapsulate or enclose*	If majority of surface is sound, use encapsulant (mesh system may strengthen)*	Wet plane or wet scrape protruding surface and repaint
Control option 3	Remove component*	Large areas like wainscoat may be enclosed*	Strip surface to remove lead-based paint and repaint*
Control option 4	Remove paint*	Remove component*	Replace trim*

* Indicates certified abatement contractor required

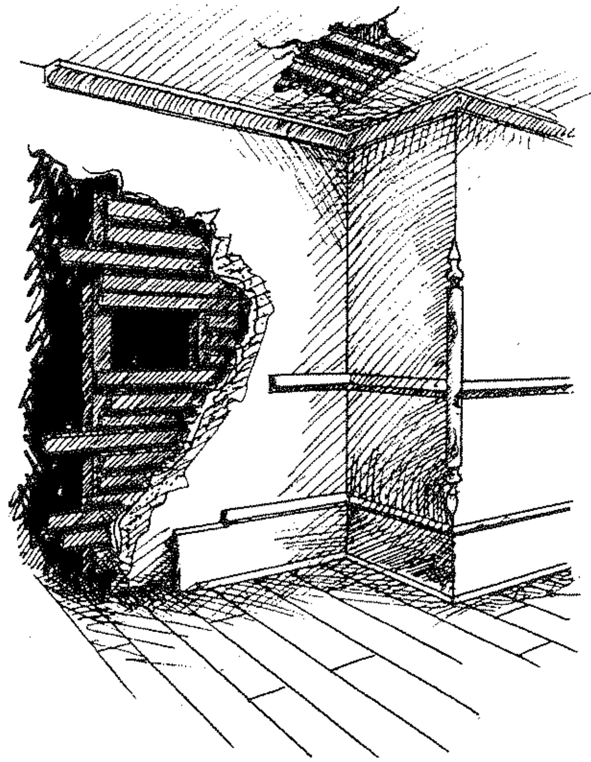
Floors and Staircase Treads



	Floors	Staircase treads
Condition	Abrasion of painted floor	Abrasion of painted tread/riser
Potential cause	Foot traffic	Foot traffic
Prerequisite repairs		
Control option 1	Stabilize paint and cover with polyurethane or high quality paint	Carpet entire width of stair (this is an interim control measure)
Control option 2	Enclose with underlayment, then install wood or vinyl; enclose with tongue and groove floor*	Enclose tread with rubber or vinyl (metal nose is recommended); enclose riser with plywood or some other hard material (must fit snugly and be rear caulked)*
Control option 3	Sand with attached HEPA vacuum and seal with polyurethane or high quality paint	Remove and replace with new treads*
Control option 4	There may be encapsulation systems approved for encapsulating a floor	Remove all paint and repaint*

* Indicates certified abatement contractor required

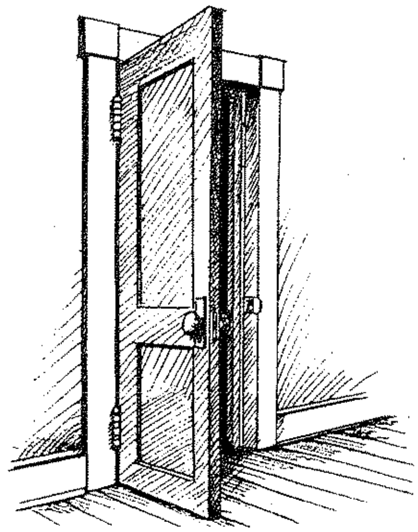
Walls and Ceilings



	A	B	C
Condition	Surface paint coat failure (peeling, flaking)	Delamination of multiple paint layers from plaster	Paint failure revealing unsound substrate (e.g., lath pulling from joints)
Potential cause	Poor surface preparation	Moisture	Moisture
Prerequisite repairs		See Section 4 on moisture problems and repairs	See Sction 4 on moisture problems and repairs
Control option 1	Stabilize paint (wet scrape and repaint)	If delamination is in small areas, encapsulate with a mesh system*	Enclose wall, mechanically fasten enclosure to structure (not lath); edge seal perimeter, particularly bottom*
Control option 2	Encapsulate or enclose, then repaint	Enclose wall, mechanically fasten enclosure to structure (not lath); edge seal perimeter, particularly bottom*	Remove existing wall surface and substrate and replace with new wall surface*
Control option 3	Replace*	Replace*	Replace*

* Indicates certified abatement contractor required

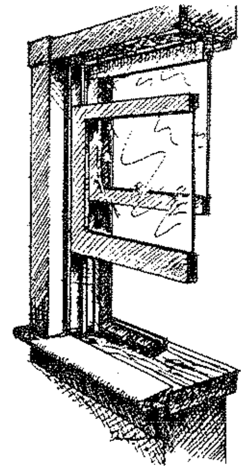
Door With Impact and/or Friction Points



	A	B	C	D
Condition	Door edge rubbing latch side of jamb	Door edge crushing latch side of jamb	Door edge crushing stop molding on hinge side of jamb	Door jamb or door structurally damaged beyond repair
Potential cause	Door swelling or paint build up; jamb out of square due to settling; hinge screws loose	Poorly hung door; paint build up; loose screws	Door swelling or paint build up	Purposeful impact damage; dry rot from moisture; severe settling or seismic damage
Prerequisite repairs	Tighten hinge screws or (if necessary) move hinges to sound wood	Same as A	Same as A	Deal with purposeful impact damage (by others); address source of moisture (See Section 4)
Control option 1	If still rubbing, remove door and hinge leaves; plane hinge edge of door and rehang	Same as A (when refastening hinge leaf, recutting may not be necessary)	Remove stop molding; wet scrape jamb at stop molding edges; install new molding away from door face	Install pre-hung door in old jamb; replace casing (this is an enclosure)*
Control option 2	Replace door and/or jamb*	Replace door and/or jamb*	If rabbeted jamb, remove door and reset hinges away from stop edge	Remove jamb casing and door and replace*
Control option 3			Replace door and/or jamb*	

* Indicates certified abatement contractor required

Windows



	A	B	C	D
Condition	Single coat and/or multi-coat paint failure on stool; tooth marks	Single coat and/or multi-coat paint failure on trough and/or sill	Abrasion or chipping of paint	Sash and/or jamb rotted or structurally damaged
Potential cause	Moisture; impact; child chewing on edge	Exterior weather; no drainage through storm window frame	Sash rubbing against lead-painted jamb; sash impacts on trough	Moisture/weather damage
Prerequisite repairs		Drill out two holes through storm window frame flush with sill		
Control option 1	Wet plane edge of stool; wet scrape top of stool and repaint	Enclose with vinyl or aluminum*	Remove and replace stop and parting bead, wet scrape contact edge of sash (can fix top sash and address bottom sash only)	Replace sash and install in new molding*
Control option 2	Encapsulate with mesh system (except in case of chewing), or cover stool and/or trough with metal coil stock*	Replace sill (as sill is a structural member, it may be cost-effective to replace window, including jamb)*	Replace sash in compression track*	Replace sash with replacement window*
Control option 3	Replace stool*	Replace window system*	Replace window system*	Replace sash, jamb casing, stool, and apron*
Control option 4	Replace window system*			Historic: off site, strip sash and casing or replace casing; on site, strip jamb

* Indicates certified abatement contractor required

Wood Siding and Masonry Walls and Foundations

	Wood siding	Masonry walls and foundations
Condition	Peeling paint; single surface or multi-coat paint failure	Singe surface or multi-coat paint failure
Potential cause	Weather or condensation of interior moisture	Moisture absorbed by masonry
Prerequisite repairs	See Section 4 on moisture problems and solutions; if structural problems exist, repair	See Section 4 on moisture problems and solutions; if structural problems exist, repair
Control option 1	Wet scrape and repaint or encapsulate	Wet scrape and repaint or encapsulate
Control option 2	For multi-coat failure, small areas can be chemically stripped or heat gunned to substrate; oil or seal wood and repaint*	Water blasting must be fully enclosed, all water contained and pumped into drums and tested for toxicity*
Control option 3	Enclose wall with tyvec and install siding (if siding is aluminum or vinyl it must be properly vented)*	Wall may be enclosed with brick veneer*
Control option 4	Historical: replace siding with equivalent pattern; if possible, install inside vapor barrier and tightly insulate*	Note: contained sand blasting may destroy brick surface and expose to damage

* Indicates certified abatement contractor required

Case Study

Section 16 contains two exercises on interpreting data and selecting hazard controls. These exercises will examine:

Costs. It is very important to recognize that the cost of lead hazard control work will be a significant constraint on the options that are available to most owners. A risk assessor may need to set priorities among hazards and explain which hazards require immediate abatement or other action. While recognizing cost constraints, a risk assessor should always provide information about more protective options, even if they are out of the owner's perceived current price range.

Funding. A successful risk assessor will understand alternative sources of funding in a community that will help owners get around their perceived cost constraints. These funding sources could include government programs or utilities that provide rebates for window replacement as part of a weatherization program. The owner may also be able to take advantage of IRS tax deductions.

Degree of hazards. Even if cost is not a serious constraint, it will often be helpful to property owners to outline the severity of the hazards so that they can plan their response. For example, if a family cannot be relocated, and the hazards found in a unit can all be treated by interim controls, interim controls may be the preferable option until turnover.

Availability of hazards to at-risk residents. The prioritization of hazards will not only be affected by the severity of the physical damage, but also by the availability of the hazards to at-risk residents. For example, the hazards present in a basement that is never used by the children of the house are not as important as the hazards in the children's bedroom and play areas. Of course, a risk assessor should always be aware that use patterns may change over time, and he/she should never disregard a hazard.

Future use. The future use of a property can also affect how the risk assessor should present hazard control options to the owner. When it is known that the owner will be renovating a room in a year, the recommendation will be different than when no renovation plans exist. The fact that a unit may soon be up for sale could affect the recommendations.

Ability to carry out future maintenance and monitoring. A poorly maintained building may suggest that options that require frequent maintenance and monitoring are not viable. In multi-family housing, the review of the maintenance and management questionnaires could provide similar information which would suggest that the risk assessor should not recommend some interim controls.

Key Concepts

- The final product of a risk assessment is a report listing all identified hazards and the options an owner has for controlling them.
- Abatement is any method that controls exposure to lead-based paint hazards with an expected design life of at least 20 years.
- Interim controls include any method that reduces exposure to lead-based paint hazards in the near term.
- Interim controls include:
  - paint film stabilization;
  - friction and impact surface treatments;
  - dust removal;
  - covering with non-permanent coverings (e.g., grass, sod, mulch).
- Abatement includes:
  - building component replacement;
  - enclosure;
  - encapsulation;
  - paint removal by heat gun, chemical stripper, or contained abrasive methods;
  - permanent soil covering (paving);
  - soil removal and replacement.
- Four major types of regulated activities that accompany lead hazard control work include:
  - containment;
  - work practices and OSHA requirements;
  - waste management;
  - cleanup and clearance.
- The five steps for paint film stabilization are:
  - completing prerequisite repairs to address moisture and/or structural problems
  - removing loose surface material by wet scraping or wet sanding
  - surface cleaning and deglossing (if necessary)
  - application of primer
  - application of primer-compatible topcoat

Estimated Lead-based Paint Hazard Control Costs

Estimated Lead-based Paint Hazard Control Costs

Key for units of measure

A	=	Allowance	LF	=	2 Linear Foot
AL	=	Allowance	OP	=	Opening
CY	=	Cubic Yard	RI	=	Riser
DY	=	Day	RM	=	Room
EA	=	Each	SF	=	Square Foot
EL	=	Elevation	M	=	1,000

Note: These cost estimates have been developed for single family row homes in Baltimore. Costs in multi-family housing may be far less due to economies of scale. Costs in other areas may differ. Costs of hazard controls done as part of renovation may also be far less than shown in the following tables. Risk assessors should develop their own local cost estimates. The following estimates include the cost of labor, materials, overhead and profit. (Estimates are in 1993–94 dollars.) Owners should always obtain precise estimates from several certified contractors before proceeding with hazard control work.

Rough estimated costs for worksite preparation

Task	Units	Estimate
Daily relocation	DY	$0–75.00
Temporary relocation	DY	0–167.00
Interior preparation — level 1*	RM	10.00–63.00
Interior preparation — level 2*	RM	20.00–120.00
Interior preparation — level 3*	RM	30.00–155.55
Interior preparation — level 4*	RM	35.00–190.00
Exterior preparation — level 1*	EL	20.00–35.00
Exterior preparation — level 2*	EL	20.00–35.00
Exterior preparation — level 3*	EL	20.00–35.00
Window site preparation	EL	40.00–69.00
Seal floor and furnace ducts	RM	5.00–23.00

* See 1995 HUD *Guidelines* for description

Estimated Lead-based Paint Hazard Control Costs

Rough estimated costs for cleaning and sealing

Task	Units	Estimate
HEPA vacuum	RM	$5.00–32.00
Wet clean	RM	5.00–17.25
HEPA/wet clean/HEPA	RM	10.00–52.00
Wax floor	SF	.10–.60
Seal floors	SF	.15–.90
Custom sealing	AL	0
Steam clean carpet	RM	10.00–46.00
Commercial clean curtains	RM	67.00–115.00
Furnace filter — replace	EA	7.00–23.00

Rough estimated costs for wall and ceiling treatments

Task	Units	Estimate
Clean — HEPA	SF	$.05–.09
Clean — HEPA/wet wipe	SF	.04–.14
Clean — HEPA/wet wipe/HEPA	SF	.06–.17
Stabilization — limited surface	SF	.15–.46
Stabilize and paint acrylic	SF	.20–.58
Stabilize and paint varnish	SF	.20–.58
Stabilize and paint urethane	SF	.20–.63
Stabilize and paint alkyd	SF	.20–.61

Rough estimated costs for encapsulants

Task	Units	Estimate
Test patch encapsulant	EA	$5.00–23.00
Elastomeric encapsulant	SF	1.20–2.00
Reinforced elastomeric	SF	1.50–2.60
Epoxy encapsulant	SF	1.30–2.25
Cementitious plaster	SF	1.30–2.25

Estimated Lead-based Paint Hazard Control Costs

Rough estimated costs for enclosures

Task	Units	Estimate
Fiberglass wall mat	SF	$.60–1.05
Wall cloth/gypsum backed	SF	.70–1.15
Laminate 3/8–in gypsum	SF	.70–1.15
Laminate 1/2–in gypsum	SF	.70–1.15
Fur, hang, tape, finish gypsum	SF	.84–1.44
Laminate plywood	SF	.70–1.15
Paneling — fur and hang	SF	1.20–2.00
Laminate masonite	SF	1.40–2.30
Ceiling tiles — fiberglass	SF	.90–1.55
Ceiling tiles: gypsum	SF	2.30–3.90

Rough estimated costs to remove paint

Task	Units	Estimate
Remove paint — heat gun	SF	$.50–1.15
Remove paint — caustic	SF	.55–1.30
Remove paint — organic solvents	SF	.55–1.30
Remove paint — custom chemical	SF	.55–1.30

Rough estimated costs of component disposal

Task	Units	Estimate
Dispose of lead wall/ceiling	SF	$15.00–58.00

Estimated Lead-based Paint Hazard Control Costs

Rough estimated costs of floor treatments

Task	Units	Estimate
Vinyl tile repair	SF	$1.70–2.90
Clean floor — HEPA/TSP		
Dispose of carpet		.50–.90
Stabilize floor — alkyd	SF	.20–.65
Stabilize floor — acrylic	SF	.20–.65
Stabilize floor — urethane	SF	.20–.65
Stabilize floor — varnish	SF	.20–.75
Encapsulate floor — epoxy	SF	1.40–2.30
Floor enclosure underlay and VCT	SF	1.90–3.30
Floor enclosure underlay/sheet GDS	SF	2.05–3.50
Floor enclosure underlay, carpet, pad	SY	14.00–24.00

Rough estimated costs for stairwell treatments

Task	Units	Estimate
Stabilize staircase — acrylic	RI	$13.00–23.00
Stabilize staircase — urethane	RI	13.00–23.00
Encapsulate staircase epoxy	RI	17.00–29.00
Enclose treads — VCT	EA	16.00–28.00
Enclose riser — plywood	RI	5.40–9.20
Enclose treads and risers — wood	EA	20.00–35.00
Enclose stairwell — rubber	EA	17.00–29.00
Enclose stairwell — carpet	RI	15.00–25.00
Enclose railing system	RI	17.00–29.00
Strip stairwell — heat gun	SF	.70–1.15
Strip stairwell — caustic	SF	.75–1.30
Strip stairwell — organic solvents	SF	.75–1.30
Strip stairwell — chemical	SF	.75–1.30
Strip stairwell — wet scrape	RI	27.00–46.00
Strip stairwell — needle gun	RI	27.00–46.00
Replace stairwell — basement	RI	2.95–5.20
Replace stairwell — main	RI.	.75–1.30
Replace rail and balusters	LF	17.00–30.00
Custom stairwell treatment	RI	17.00–30.00

Estimated Lead-based Paint Hazard Control Costs

Rough estimated costs for window treatments

Task	Units	Estimate
Stabilize window — acrylic	EA	$15.00–25.00
Stabilize window — alkyd	EA	16.00–28.00
Stabilize window — urethane	EA	16.00–28.00
Stabilize window — misc.	EA	16.00–28.00
Encapsulate window — epoxy	EA	27.00–46.00
Window-fix closed/stabilize	EA	17.00–29.00
Window wrap well and stabilize	EA	30.00–115.00
Window — stool, liners, stabilize	EA	45.00–155.00
Replace lower sash, stool, liners	EA	90.00–225.00
Strip window — heat gun	EA	74.00–127.00
Strip window — caustic	EA	74.00–127.00
Strip window — organic solvents	EA	74.00–127.00
Replace sash/strip jam — historic	EA	150.00–443.00
Vinyl window with storm	EA	110.00–316.00
Vinyl DH, DG window	EA	200.00–345.00
Vinyl DH, DG, low-E window	EA	255.00–437.00
Aluminum SH — DG window	EA	150.00–345.00
Wood DH, DG low window	EA	268.00–460.00
Wood, DH, DG, window	EA	140.00–368.00
Window/replace window/dryer vent	EA	160.00–276.00
Basement window vinyl	EA	150.00–259.00
Transom — stabilize	EA	23.00–40.00
Transom — replace plywood	EA	34.00–58.00
Window — remove, patch envelope	EA	100.00–397.00

Estimated Lead-based Paint Hazard Control Costs

Rough estimated costs for door treatments

Task	Units	Estimate
Door — stabilize & paint acrylic	EA	$19.00–32.00
Door — stabilize & paint alkyd	EA	20.00–35.00
Door — stabilize & urethane	EA	20.00–35.00
Door — stabilize & misc. paint	EA	20.00–35.00
Door — stabilize Plan, Adjust	EA	40.00–69.00
Strip, paint, strike rail & jamb	EA	13.00–23.00
Door: reinforced elastomeric	EA	40.00–69.00
Door — strip, off site, rehang	EA	111.00–190.00
Strip door — heat gun	EA	30.00–52.00
Door — strip — wet scrape	EA	30.00–52.00
Door strip — caustic	EA	40.00–69.00
Strip door — organic solvent	EA	40.00–69.00
Door strip — custom chemical	EA	40.00–69.00
Door replace — 6 panel	EA	120.00–200.00
Door replace — hollow core	EA	40.00–69.00
Door replace — bifold	EA	44.00–75.00
Stop molding — replace	OP	10.75–18.40
Door — remove, package & dispose	EA	8.00–14.00
Remove door, close opening	EA	47.00–80.00
Laminate jamb — wood	EA	34.00–58.00
Door replace — prehung hollow core	EA	111.00–190.00
Door replace — prehung 6-panel	EA	185.00–316.00
Door ext. — replace flush	EA	84.00–144.00
Door ext. — replace paneled	EA	144.00–247.00
Door ext. — replace metal prehung	EA	0
Door ext. — replace prehung flush	EA	240.00–414.00
Strip door sill	EA	20.00–35.00
Strip door jamb	EA	17.00–29.00
Laminate exterior jamb — aluminum	EA	34.00–58.00
Door — remove patch envelope	EA	232.00–397.00

Estimated Lead-based Paint Hazard Control Costs

Rough estimated costs for trim treatments

Task	Units	Estimate
Trim stabilize and paint acrylic	LF	$.55–.90
Trim stabilize and paint varnish	LF	.55–.90
Trim — encapsulate epoxy	LF	.95–1.60
Trim-elastomeric encapsulant	LF	.95–1.60
Trim reinforced elastomeric	LF	1.05–1.80
Trim — enclose aluminum	LF	1.40–2.30
Trim — enclose plywood	FL	1.40–2.30
Trim-reverse	LF	.70–1.15
Trim-enclose vinyl	LF	2.55–4.40
Trim-strip off site	LF	1.50–2.50
Trim-strip with heat gun	LF	.60–1.05
Trim — strip caustic	LF	.60–1.05
Strip trim — organic solvents	LF	.75–1.30
Trim — strip with scrapers	LF	.60–1.05
Trim — replace 1–in x 3–in	LF	.80–1.35
Trim — replace 1–in x 4–in	LF	1.70–2.90
Trim — replace historic	LF	2.70–4.60
Trim — dispose of, patch wall	LF	.17–.30

Rough estimated costs for fixtures and furnishings

Task	Units	Estimate
Skylight-enclose luan	EA	$50.00–86.00
Stabilize radiator	EA	27.00–46.00
Stabilize footed tub	EA	30.00–52.00
Stabilize cabinet	LF	17.50–30.00
Radiator-strip prime top coat	EA	40.00–69.00

Rough estimated costs for replacement

Task	Units	Estimate
Replace Play Equipment	EA	$0
Replace Furniture	EA	0

Estimated Lead-based Paint Hazard Control Costs

Rough estimated costs for exterior treatments

Task	Units	Estimate
Ext. stabilization — LTD surface	SF	$.55–.90
Ext. stabilize and paint acrylic	SF	.30–.60
Stabilize and paint alkyd	SF	.40–.70
Ext. stabilize & paint metal	SF	.40–.70
Stabilize and paint 4	SF	0
Ext. encap. polyamide epoxy	SF	1.00–1.75
Ext. encap. elastomeric	SF	1.00–1.75
Ext. encap reinforce elastomeric	SF	1.85–3.15
Ext. encap cementitious plaster	SF	2.55–4.35
Ext. encapsulate custom	SF	1.40–2.30
Enclose tyvek/vinyl siding	SF	1.90–3.30
Enclose tyvek/aluminum siding	SF	1.90–3.30
Enclose sheathing/vinyl	SF	2.05–3.50
Enclose tyvek/t1-11	SF	1.40–2.30
Enclose tyvek/board std.	SF	0
Enclose siding misc.	SF	0
Enclose pipe/column	LF	4.00–6.90
Enclose trim — aluminum	LF	1.75–3.00
Enclose soffit/aluminum	LF	0
Enclose misc. trim/aluminum	AL	0
Enclose trim — wood	LF	1.40–2.40
Ext. remove paint — heat gun	SF	0
Ext. remove paint — organ. solvent	SF	94.00–160.00
Ext. remove paint — scrapers	SF	1.20–2.00
Ext. remove paint — HEPA blast	SF	1.40–2.30
Ext. remove paint — needle gun	SF	1.20–2.00
Exterior trim/replace lattice	SF	2.00–3.45
Replace exterior trim	LF	3.00–5.20
Replace railing	LF	6.70–11.50
Dispose of trim	LF	0
Dispose of exterior item	EA	0

Estimated Lead-based Paint Hazard Control Costs

Rough estimated costs for porches

Task	Units	Estimate
Porch-spot prep-spot paint	SF	$0
Porch-complete stabilize	SF	.95–1.60
Porch encapsulate miscellaneous	SF	1.40–2.30
Enclose porch deck — plywood	SF	0
Enclose porch deck/T & G	SF	1.85–3.15
Enclose porch ceiling — ply	SF	1.70–2.90
Enclose porch ceiling — gypsum	SF	0
Ext. replace railing system	LF	17.00–29.00
Railing with balusters 36–in	LF	17.00–29.00
Replace column 4–in x 4–in	EA	44.00–75.00
Replace column turned	EA	180.00–310.00
Replace column — decorative	EA	74.00–127.00
Exterior: replace porch deck	SF	2.50–4.30
Replace landing	SF	4.00–6.90
Exterior: stair system	LF	37.00–63.00
Replace rear porch	EA	0
Dispose of porch	SF	2.00–3.45
Dispose of exterior item	EA	0

Rough estimated costs for soil treatments

Task	Units	Estimate
HEPA vac exterior chips	SF	$.70–1.15
Seed and tack	SF	.30–.55
Sod	SF	.70–1.15
Regrade at foundation and sod	SF	2.70–4.60
Regrade at foundation and seed	SF	1.70–2.90
Mulch 4 in	SF	.40–.70
Encapsulate playground with sand	SF	1.25–2.15
Pour concrete patio/skirt	SF	4.00–6.90
Form and pour concrete walk	SF	0
Form and pour asphalt walk	SF	0
Form and fill gravel walk	SF	0
Soil disposal — general	SF	0
Replace soil — on site	CY	34.00–58.00
Soil replacement	EA	0
Rototill topsoil/seed	SY	0
Foundation planting	EA	30.00–52.00
Foundation fence	LF	0
Install walk off mat	EA	20.00–34.00
Soil — install	SY	0

Estimated Lead-based Paint Hazard Control Costs

Rough estimated costs for outbuildings

Task	Units	Estimate
Dispose of garage/outbuildings	EA	$536.00–920.00

SECTION 12

ONGOING MONITORING

Learning Objectives

After completing this section, the student should be able to

- know when ongoing monitoring is and is not appropriate in a given unit;
- know how to use the schedules contained in the 1995 HUD *Guidelines* and apply them to a specific hazard control strategy in a dwelling unit;
- understand the philosophy behind following a more frequent and ongoing monitoring schedule for interim controls than for abatement actions;
- name the two instances in which ongoing monitoring is necessary.

Introduction and Applicability

Ongoing monitoring is a systematic approach for ensuring that dwelling units free of lead-based paint hazards continue to be hazard-free. This is accomplished through the evaluation of potential hazards and the management and maintenance of the lead-based paint that remains in the unit. In short, this means checking on paint condition, levels of lead in dust and soil, and integrity of control methods on a regular basis. Particular attention should be paid to the interim control measures that require regular maintenance and monitoring. Risk assessors may be called upon to both establish monitoring plans for each hazard control option identified and/or to conduct such monitoring.

Ongoing monitoring is appropriate in units where

- lead-based paint is known or suspected to be present but in which no lead-based paint hazards currently exist;
- no active control measures are necessary.

Such dwellings could develop lead-based paint hazards if the lead-based paint that remains in the unit deteriorates. For example, paint can deteriorate through normal use and maintenance activity. Ongoing monitoring includes a professional reevaluation by a certified risk assessor and periodic visual surveillance by the owner.

Units Requiring Reevaluation

The potential always exists for lead-based paint hazards to develop because hazard control methods can fail. For example, encapsulants may peel, or paint stabilization may not be effective. Previously intact lead-based paint can deteriorate, and leaded dust can reaccumulate through friction, impact, or the introduction of exterior soil or dust. The following cases are good examples for potential hazards:

- units that pass clearance tests after some forms of abatement and/or interim controls; and
- units where an initial risk assessment found no lead-based paint hazards but lead-based paint is known or suspected to be present (i.e., units that have not been inspected).

Introductions and Applicability

Units Exempt From Ongoing Monitoring

Units that contain no lead-based paint or that complete all applicable reevaluation requirements are exempt from further reevaluation. Examples include

- units where a combined risk assessment/inspection shows no lead-based paint present and soil and dust levels are below applicable limits;
- units where all building components with lead-based paint were removed and/or all lead-based paint was removed and risk assessment shows soil and dust below federal, state, or local levels.

However, all units with known or suspected lead-based paint should have at least an annual visual surveillance performed by the owner.

Key Elements of Ongoing Monitoring

The HUD *Guidelines* offer the most comprehensive discussion of systematic ongoing monitoring. HUD recommends the ongoing monitoring consists of two key elements:

- reevaluations by a certified risk assessor;
- annual visual surveys by the owner.

The HUD ongoing monitoring protocol is discussed on the following pages.

Reevaluations

Overview

Reevaluations are risk assessments with more limited soil and dust sampling. Reevaluations include

- detailed visual examination of paint films and existing hazard controls (e.g., enclosures, encapsulants);
- limited interior dust and soil sampling.

Visual Examination—Key Steps

The visual examination is a shortened and more targeted version of the general risk assessment visual examination. In this case, lead hazards previously identified and controlled are targeted. The key steps are shown below.

- Gather and review past risk assessment, paint inspection, clearance, and reevaluation reports to learn where previous hazard control work was done and whether lead-based paint is known to exist.
- Conduct a careful visual examination of:
    - all known or suspected lead-based paint to determine if paint is still intact. Use past paint inspection results, if available, to identify surfaces with lead-based paint. If no inspection occurred, test surfaces or assume all surfaces have lead-based paint;

      and
    - past hazard control measures to determine if they have failed (e.g., peeling encapsulants, deteriorated paint that had been stabilized, breached enclosure, or soil cover such as gravel or mulch that is no longer intact).
- Document results. Prepare a written summary of results. If any lead-based paint hazards (either new hazards or failures of hazard control measures) are found, identify the surface and condition, and identify acceptable options for controlling the hazard.
- Recommend that hazards that have been identified be controlled before conducting dust or soil sampling.

Reevaluations

Dust Sampling—Key Steps

The overall purpose of dust sampling is to determine the effectiveness of any control measures in use and to determine if leaded dust has reaccumulated. For reevaluation, dust sampling involves the following steps:

- Confirm that any hazards identified during visual examination were corrected.
- Identify dust sampling locations and sampling plan. The recommended sampling plan is similar to the lead hazard screen:
  - use at least two composite samples—one from floors and one from either window sills or window troughs;
  - collect no more then four subsamples for each composite sample;
  - collect floor samples from hard surfaces; if wall-to-wall carpeting exists, collect an additional floor composite sample (i.e., do not composite samples from carpets and hard surfaces into a single sample).

Lead Hazard Reevaluation
Locations for Composite Dust Sampling

Uncarpeted floors

- 1st child's bedroom
- 2nd child's bedroom
- Children's principal play area
- Main entryway
- Additional location (if necessary)

Window troughs

- 1st child's bedroom
- 2nd child's bedroom
- Children's principal play area
- Additional locations (e.g., high-use windows)

- Conduct dust wipe tests and compare results with HUD and EPA guidelines and applicable state standards. If levels exceed these standards, a lead hazard exists, and the unit does not pass its reevaluation. In this case further cleaning and/or hazard control work

Reevaluations

is necessary, followed by clearance and reevaluation according to the appropriate schedule.

Soil Sampling

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

Soil sampling may need to be conducted if previously covered spots have become bare. The owner may prefer to sample soil lead rather than recovering the bare soil, using interim control measures.

If soil sampling is conducted, composite sampling is recommended, with between five to ten subsamples in each composite.

Qualified Personnel

HUD recommends that reevaluations be conducted by a certified risk assessor.

Schedule

The only existing schedule for reevaluation is presented in the HUD *Guidelines*. Reevaluation should occur at specific intervals specified in the "Standard Reevaluation Schedule" (SRS) on the following page. The SRS was excerpted from Chapter 6 of the HUD *Guidelines For The Evaluation and Control of LBP Hazards in Housing*.

Table 6.1
Standard Reevaluation Schedules (See Notes to Table 6.1.)

Schedule	Evaluation Results	Action Taken	Reevaluation Frequency	Visual Survey (by owner or owner's representative)
1	Combination risk assessment/inspection finds no leaded dust or soil and no lead-based paint.	None	None	None
2	No lead-based paint hazards found during risk assessment conducted before hazard control or at clearance (hazards include dust and soil).	None	3 years	Annually and whenever information indicates a possible problem
3	The average of leaded dust levels on all floors, interior window sills, or window troughs sampled exceeds the applicable standard, but by less than a factor of 10.	A. Interim controls and/or hazard abatement (or mixture of the two), including, but not necessarily limited to, dust removal. This schedule does not include window replacement.	1 year, 2 years	Same as Schedule 2, except for encapsulants. The first visual survey of encapsulants should be done one month after clearance; the second should be done six months later and annually thereafter.
		B. Treatments specified in section A plus replacement of all windows with lead hazards	1 year	
		C. Abatement of all lead-based paint using encapsulation or enclosure	None	Same as Schedule 3 above
		D. Removal of all lead-based paint	None	None
4	The average of leaded dust levels on all floors, interior window sills, or window troughs sampled exceeds the applicable standard by a factor of 10 or more.	A. Interim controls and/or hazard abatement (or mixture of the two), including, but not necessarily limited to, dust removal. This schedule does not include window replacement.	6 months, 1 year, 2 years	Same as Schedule 3
		B. Treatments specified in section A plus replacement of all windows with lead hazards	6 months, 2 years	Same as Schedule 3
		C. Abatement of all lead-based paint using encapsulation and enclosure.	None	Same as Schedule 3
		D. Removal of all lead-based paint	None	None
5	No leaded dust or leaded soil hazards identified, but lead-based paint or lead-based paint hazards are found.	A. Interim controls or mixture of interim controls and abatement (not including window replacement)	2 years	Same as Schedule 3
		B. Mixture of interim controls and abatement, including window replacement	3 years	Same as Schedule 3
		C. Abatement of all lead-based paint **hazards**, but not all lead-based paint	4 years	Same as Schedule 3
		D. Abatement of all lead-based paint using encapsulation or enclosure	None	Same as Schedule 3
		E. Removal of all lead-based paint	None	None

Table 6.1 (continued)

Schedule	Evaluation Results	Action Taken	Reevaluation Frequency	Visual Survey (by owner or owner's representative)
6	Bare leaded soil exceeds standard, but less than 5,000 µg/g.	Interim controls	None	3 months to check new ground cover, then annually to identify new bare spots
7	Bare leaded soil greater than or equal to 5,000 µg/g.	Abatement (paving or removal)	None	None for removal, annually to identify new bare spots or deterioration of paving

Notes to Table 6.1:

1. When more than one schedule applies to a dwelling, use the one with the most stringent reevaluation schedule. Do not use the results of a reevaluation for Schedule 2.
2. A lead-based paint hazard includes deteriorated lead-based paint and leaded dust and soil above applicable standards.
3. The frequency of reevaluations and the interval between reevaluations depends on the findings at each reevaluation and the action taken. For example, a dwelling unit or common area falling under Schedule 3.A would be reevaluated one year after clearance. If no lead-based paint hazards are detected at that time, the unit or area would be reevaluated again two years after the first reevaluation. If no hazards are found in the second reevaluation, no further reevaluation is necessary, but annual visual monitoring should continue.

   If, on the other hand, the unit or common area fails a reevaluation, a new reevaluation schedule should be determined based on the results of the reevaluation and the action taken. For instance, if the reevaluation finds deteriorated lead-based paint but no lead-contaminated dust, and the action taken is paint stabilization, Schedule 5.A would apply, which indicates that the next reevaluation should be in two years. If, however, the owner of this same property decides to abate all lead-based paint hazards instead of doing only paint stabilization, the property would move to Schedule 5.C, which calls for reevaluation four years from the date of clearance after the hazard abatement.

   Following another scenario, suppose a reevaluation of this same dwelling unit or common area finds that the average dust lead levels on sampled window troughs exceeds the applicable standard by a factor of 10 or more, but no other lead-based paint hazards. The owner conducts dust removal. In this case the next reevaluation would be six months after clearance.
4. The initial evaluation results determine which reevaluation schedule should be applied. An initial evaluation can be a risk assessment, a risk assessment/ inspection combination, or, if the owner has opted to bypass the initial evaluation and proceed directly to controlling suspected hazards, a combination risk assessment/clearance examination. This type of clearance must be conducted by a certified risk assessor, who should determine if all hazards were in fact controlled. The results of the initial clearance dust tests, soil sampling and visual examination should be used to determine the appropriate schedule. If repeated cleaning was necessary to achieve clearance, use the results of the dust tests **before** repeated cleaning was performed for schedule determination.
5. If a unit fails two consecutive reevaluations, the reevaluation interval should be reduced by half and the number of reevaluations should be doubled. If deteriorated lead-based paint hazards continue to occur, then the offending components/surfaces should be abated. If dwellings with dust hazards but no paint-related hazards repeatedly fail reevaluations, the exterior source should be identified (if identification efforts fail, regular dust removal efforts are needed).

Reevaluations

Conditions Resulting in Reevaluation Failure

The discovery of any of the following conditions should result in a failure of the reevaluation:

- Interior dust leads exceed any federal/state/local or other applicable standards. Current EPA and HUD guidelines for hazardous levels of lead dust are as follows:

Surface Area	Lead Loading ($\mu g/ft^2$)
Floors	100 $\mu g/ft^2$
Interior window sills	500 $\mu g/ft^2$
Window troughs (wells)	800 $\mu g/ft^2$

  If state or local dust hazard numbers are lower (more conservative), they should be used. The EPA expects to promulgate federal regulatory standards for interior dust; once such standards exist, all state and local standards must be at least as protective as such federal standards.

- Bare soil has lead levels in excess of 400 µg/g in play areas and 2,000 µg/g in other areas. These soil action levels were presented in EPA's recent *Guidance on Lead-Based Paint, Lead-Contaminated Dust and Lead-Contaminated Soil*. HUD recommends the same action triggers. State and local soil levels may also apply; check with your local health and environmental agencies.
- Material used to cover contaminated soil is no longer intact (e.g., bare soil shows through gravel, mulch, chips; paving is cracking).
- Hazard controls are no longer intact (e.g., peeling encapsulants, enclosures with holes, deteriorated LBP that had been stabilized).
- Paint that is known or suspected to be lead-based is found to be deteriorating.

Documentation

Risk assessors conducting the reevaluation should consult with the property owner to determine what type of reevaluation report is needed. A report documenting the presence or absence of LBP hazards is recommended. A sample report format is shown on the following page.

Sample Reevaluation Report

Reevaluations

I. Summary Information

  a. Dwelling Location:

  b. Prepared For: Name & Address

  c. Prepared By: Name & State License Number (if applicable)

  d. Date:

II. Visual Examination and Environmental Sampling Results

  a. Form 5.1—Building & Soil Condition*

  b. Form 5.2—Paint Condition on Selected Surfaces*

  c. Form 5.4a—Field Sampling for Dust (Composite)*

  d. Form 5.5—Field Sampling for Soil (Composite) [if applicable]*

  e. Previously Identified LBP Hazards and Status of Control Measures

  f. Newly Identified LBP Hazards

III. Possible Control Actions

  a. Hazard Control Measures

  b. Site-specific reevaluation Schedule

  c. Other

* Forms identified can be located in pages 5-58 through 5-64 of the HUD *Guidelines* clearance draft.

Annual Visual Survey

Overview

HUD recommends that annual visual examinations be used in conjunction with reevaluations to confirm that

- painted surfaces with known or suspected lead-based paint are not deteriorating;
- control methods used inside and on exterior soil have not failed (e.g., encapsulation, enclosure, cover for contaminated soil);
- structural problems do not threaten the integrity of known or suspected lead-based paint.

Such visual checks are intended to supplement a more extensive reevaluation.

Qualified Personnel

Visual examinations are conducted by property owners or their representatives. Visual examinations are less expensive than reevaluation, because dust sampling must be done by risk assessors. Risk assessors should discuss how to complete such a visual check with the property owner and help decide who will perform such checks (e.g., trained maintenance crews, owner).

Schedule

HUD recommends that examinations occur

- at least annually;
- whenever an owner receives a resident complaint;
- whenever the unit turns over or becomes vacant;
- whenever significant damage occurs (e.g., flood, fire, vandalism).

Documentation/Report

HUD recommends that owners document the results of their visual surveys.

Key Concepts

Ongoing monitoring is a systematic approach for ensuring that dwelling units free of lead-based paint hazards continue to be hazard-free. This means checking on paint condition, levels of lead in dust and soil, and integrity of control methods on a regular basis.

Ongoing monitoring is appropriate in units where

- lead-based paint is known or suspected to be present but in which no lead-based paint hazards currently exist;
- no active control measures are necessary.

Units Requiring Reevaluation

- Units that pass clearance tests after some types of abatement and/or interim controls; and
- Units where an initial risk assessment found no lead-based paint hazards but lead-based paint is known or suspected to be present (i.e., units that have not been inspected).

Units Exempt From Ongoing Monitoring

Units that contain no lead-based paint or that complete all applicable reevaluation requirements are exempt from further reevaluation.

Key Elements of Ongoing Monitoring

- Reevaluations by a certified risk assessor;
- Annual visual surveys by the owner.

Reevaluations

Reevaluations are risk assessments with more limited soil and dust sampling. Reevaluations include

- detailed visual examination of paint films and existing hazard controls;
- limited interior dust and soil sampling.

The visual examination is a shortened and more targeted version of the general risk assessment visual examination. The key steps are shown below.

- Gather and review past risk assessment, paint inspection, clearance, and reevaluation reports.

Key Concepts

- Conduct a careful visual examination of:
  - all known or suspected lead-based paint to determine if paint is still intact.

    and
  - past hazard control measures to determine if they have failed.
- Document results.
- Recommend that hazards that have been identified be controlled before conducting dust or soil sampling.

For dust sampling:

- Confirm that any hazards identified during visual examination were corrected.
- Identify dust sampling locations and sampling plan.
- Conduct dust wipe tests and compare results with HUD and EPA guidelines and applicable state standards.

HUD recommends that reevaluations be conducted by a certified risk assessor.

Reevaluation should occur at specific intervals specified in the "Standard Reevaluation Schedule" (SRS).

Conditions resulting in reevaluation failure are:

- Interior dust leads exceed any federal/state/local or other applicable standards.
- Bare soil has lead levels in excess of 400 μg/g in play areas and 2,000 μg/g in other areas.
- Material used to cover contaminated soil is no longer intact.
- Hazard controls are no longer intact.
- Paint that is known or suspected to be lead-based is found to be deteriorating.

A report documenting the presence or absence of LBP hazards is recommended.

Annual Visual Survey

HUD recommends that annual visual examinations be used in conjunction with reevaluations to confirm that

- painted surfaces with known or suspected lead-based paint are not deteriorating;

- control methods used inside and on exterior soil have not failed (e.g., encapsulation, enclosure, cover for contaminated soil);
- structural problems do not threaten the integrity of known or suspected lead-based paint.

Visual examinations are conducted by property owners or their representatives.

HUD recommends that examinations occur

- at least annually;
- whenever an owner receives a resident complaint;
- whenever the unit turns over or becomes vacant;
- whenever significant damage occurs (e.g., flood, fire, vandalism).

HUD recommends that owners document the results of their visual surveys.

Key Concepts

SECTION 13

Performing Risk Assessments for Housing with Children Who Have Elevated Blood Lead Levels

Learning Objectives

After completing this section, students should be able to

- define the difference between an elevated blood lead level (EBL) child investigation and a lead-based paint risk assessment;
- understand the importance of coordinating any EBL investigation in concert with local health authorities and health care providers;
- be able to implement the procedures contained in Chapter 16 of the HUD *Guidelines*;
- be able to identify some child-specific sources of lead exposure;
- use a questionnaire to identify possible sources of lead exposure not related to the dwelling.

Introduction

Houses containing children who have elevated blood lead (EBL) levels may or may not have lead-based paint hazards. While it is true that lead-based paint hazards account for most cases of childhood lead poisoning, other sources of lead may be more important in some cases.

Risk assessors may be asked to investigate dwellings where a child with an elevated blood lead level has been identified. While this endeavor is often the duty of local health departments or childhood lead poisoning prevention programs, private risk assessors possibly will be asked to investigate because of resource shortages or other health department priorities. Regardless of the cause, it is always essential that the risk assessor coordinate with and fully inform local health authorities to prevent duplication of effort and to avoid potential legal difficulties.

Most of this course is designed to enable risk assessors to detect lead-based paint hazards in housing, regardless of whether or not a child is present. This section provides information on how a risk assessor might go about investigating a house with an EBL child.

Purpose of EBL Investigations

The purpose of an EBL investigation is to identify a cause or causes for the lead poisoning of a child. A normal risk assessment attempts to identify lead-based paint hazards in a dwelling, regardless of whether or not a child is poisoned.

Investigate All Possible Sources

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 (see page 13-7) .

Authority

The property owner is not the sole decision maker regarding the appropriate hazard control options and the development of a plan when a child has been identified as having elevated blood lead levels. Local regulatory, medical, and other agencies or personnel are also involved in the decision-making process regarding hazard control options in cases of lead poisoning of a child.

Interpreting Blood Lead Levels in Children

The following table interprets the level of lead found in a child's blood and the action needed to be taken.[1]

Venous[2] Confirmed Blood Lead Level (µg/dL)	Interpretation for Children Under Age 6	Action
Below 10	Child is not lead-poisoned.	Another blood lead test may be needed next year. Inform a doctor if the child lives in a dwelling built before 1978 or in an older house that is being renovated or repainted. Control any known lead hazards.
10–14	Child has some exposure to lead.	Another blood lead test will be needed. Talk to a doctor. Control any known lead hazards.
15–19	Child has an elevated blood lead level.	Another blood lead test is needed. Talk to a doctor. Have the dwelling checked for possible lead hazards using the methods described in this section if the blood lead level persists above 15 µg/dL. Control any known hazards.
20–44	Child is considered to be lead-poisoned.	A full medical checkup including more blood lead tests and medical care are needed until the blood lead level is normal. The child needs to move to a lead-safe environment. Get professional help from the health department or from a private risk assessor or investigator to find the lead hazards.
Above 45	Child is seriously lead-poisoned.	A blood lead level over 70 µg/ dL is a medical emergency. A full medical checkup and medical treatment (chelation) is needed NOW! Hospital stay may be required. The child must be removed from lead hazards. Get professional help from the health department or from a private risk assessor or investigator to find the lead hazards. The child needs to reside in a lead-safe dwelling to get well.

[1]Adapted from the Maryland Childhood Lead Poisoning Prevention Program brochure.

[2]Blood lead levels are best measured with venous sampling, rather than with capillary (finger stick) methods, which are more susceptible to contamination.

Environmental Tests

In addition to the usual tests a risk assessor might undertake for a risk assessment, the investigator may

- test deteriorated paint on furniture identified as a potential lead hazard to the lead-poisoned child, regardless of who owns the furniture;
- conduct additional dust sampling in areas frequented by the child, e.g., in the dwelling or a vehicle, on work clothing or shoes, or in another dwelling frequented by the child;
- identify bare soil areas frequented by the child and sample individually so that the hazards in a particular play area can be quantified, including public parks or other yards; .
- test the paint surfaces of all friction, impact, and chewable surfaces;
- take water samples;
- test glazed dinnerware or ceramics.

Not all these tests would necessarily be conducted in every instance of an EBL child. In some cases, the questionnaire may reveal the likely source of contamination.

Questionnaire

A detailed questionnaire can be used as an aid to the investigator to pinpoint possible sources. This questionnaire is almost always done before environmental sampling is conducted. Public health professionals with special training in questionnaire delivery can sometimes help obtain answers.

Resident Questionnaire for Investigation of Children With Elevated Blood Lead Levels

General Information

1. Where do you think the child is exposed to the lead hazard?
2. Do you rent or own your home? rent own (circle)

   If rented, are there any rent subsidies? yes no (circle)

   If yes, what type: (check)

   ___ Public housing authority.

   ___ Section 8

   ___ Federal rent subsidy

   ___ Other, (specify): ______________________________

   Landlord Information (or rent collector agent)

   Name: ______________________________

   Address: ______________________________

   Phone: ______________________________
3. When did you/your family move into this home?

   Complete the following for all addresses where the child has lived during the past 12 months:

Dates of residency	Address (include city and State)	Approximate age of dwelling	General condition of dwelling. Specify any painted surfaces. Any remodeling or renovation?

4. Is the child cared for away from the home? (This would include pre-school, day-care center, day-care home, or care provided by a relative or friend.) yes no (circle)

   If YES, complete the following:

Type of care	Location of care (name of contact, address, and phone number)	Approximate number of hours per week at this location	General condition of structure. Specify any painted surfaces. Any recent remodeling or renovation?

Resident Questionnaire for Investigation of Children With Elevated Blood Lead Levels (Cont.)

Lead-based Paint and Lead-contaminated Dust Hazards

1. Has this dwelling been tested for lead-based paint or lead-contaminated dust? yes no (circle)

   If yes, when? Where can this information be obtained? ____________________

   ____

2. Approximately what year was this dwelling built? If unknown, was the dwelling built before 1950? ____________________

3. Has there been any recent repainting, remodeling, renovation, window replacement, sanding, or scraping of painted surfaces inside or outside this dwelling unit? If yes, describe activities and duration of work in more detail. ____________________

   ____

4. Has any lead abatement work been conducted at this dwelling recently? yes no (circle)

5. Where does the child like to play or frequent? (Include rooms, closets, porches, out buildings.)

   ____

6. Where does the child like to hide? (Include rooms, closets, porches, out buildings.)

   ____

Complete the following table:

Areas where child likes to play or hide	Paint condition (good, fair, poor, or not present)*	Location of painted component with visible bite marks

* Paint condition: Note location and extent of any visible chips and/or dust in window wells, on window sills, or on the floor directly beneath windows. Do you see peeling, chipping, chalking, flaking, or deteriorated paint? If yes, note locations and extent of deterioration.

Resident Questionnaire for Investigation of Children With Elevated Blood Lead Levels (Cont.)

Assessment: (check)

_____ Probable lead-based paint hazard

_____ Probable leaded dust hazard

Action: (check)

_____ Obtain records of previous environmental testing noted above

_____ XRF Inspection of dwelling (circle): limited complete

_____ Paint testing—deteriorated paint: add any additional areas to Form 5.3.

_____ Leaded dust sampling of home: add any additional areas to the list of rooms to be sampled, using Form 5.4

_____ Other sampling (specify): ____

Resident Questionnaire for Investigation of Children With Elevated Blood Lead Levels (Cont.)

Water Lead Hazards

1. What is the source of drinking water for the family? (circle) municipal water private well

   Other (specify): ____________________

   (This information will be used to help determine responsibility and methods of controlling lead exposure from water.)

If tap water is used for drinking, please answer the following:

2. From which faucets do you obtain drinking water? (Sample from the main drinking water faucet.) ____________________
3. Do you use the water immediately or do you let the water run for a sort time first? ________
   (If water lead levels are elevated in the first flush, but low in the flushed sample, recommend flushing the water after each period the water has remained standing in the pipe for more than 6 hours.)
4. Is tap water used to prepare infant formula, powdered milk, or juices for the children? ______

   If yes, do you use hot or cold tap water? ____________________

   If no, from what source do you obtain water for the children? ____________________
5. Has new plumbing been installed within the last 5 years? yes no (circle)

   If yes, identify location(s). ____________________

   Did you do any of this work yourself? yes no (circle)

   If yes, specify. ____________________
6. Has the water ever been tested for lead? yes no (circle)

   If yes, where can test results be obtained? ____________________
7. Is the glazing on the bathtub used by the child old or deteriorated? yes no (circle)

> Determine whether the dwelling located in the jurisdiction is known to have lead in drinking water problems in either public municipal or well water. Consult with state/local public health authorities for details. (check) _____at risk _____not at risk

Assessment: (check)

_____ At risk for water lead hazards

Actions: (check)

_____ Test water (first draw and flush samples)

_____ Other testing (specify): ____________________

_____ Counsel family (specify): ____________________

Resident Questionnaire for Investigation of Children With Elevated Blood Lead Levels (Cont.)

Lead in Soil Hazards

(Use the following information to determine where soil samples should be collected.)

1. Where outside does the child like to play? ______________________
2. Where outside does the child like to hide? ______________________
3. Is this dwelling located near a lead industry, such as a battery plant, smelter, radiator repair shop, or electronics/soldering industry? yes no (circle)
4. Is the dwelling located within two blocks of a major roadway, freeway, elevated highway, or other transportation structures? ______________________
5. Are nearby buildings or structures being renovated, repainted, or demolished? __________
6. Is there deteriorated paint on outside fences, garages, play structures, railings, or mail boxes?

   ____

7. Were gasoline or other solvents ever used to clean parts or disposed of at the property?

   ____

8. Are there visible paint chips near the perimeter of the house, fences, garages, play structures? If yes, note location. ______________________
9. Has soil ever been tested for lead? If yes, where can this information be obtained?

   ____

10. Have you burned painted wood in a woodstove or fireplace? If yes, have you emptied ashes onto soil? If yes, where?

    ____

Assessment: (check)

_____ Probable soil lead hazard

Actions: (check)

_____ Test soil. Complete Field Sampling Form for Soil (Form 5.5). Obtain single samples for each bare soil area where the child plays.

_____ Advise family to obtain washable doormats for entrances to the dwelling.

_____ Counsel family to keep child away from bare soil areas thought to be at risk.

(specify): ______________________

Resident Questionnaire for Investigation of Children With Elevated Blood Lead Levels (Cont.)

Occupational/Hobby Lead Hazards

Use the information in this section to determine if the child's source of lead exposure could be related to the parents', older siblings', or other adults' work environment. Occupations that may cause lead exposure include the following:

- Paint removal (including sandblasting, scraping, abrasive blasting, sanding, or using a heat gun or torch)
- Chemical strippers
- Remodeling, repairing, or renovating dwellings or buildings, or tearing down buildings or metal structures (demolition)
- Plumbing
- Repairing radiators
- Melting metal for reuse (smelting)
- Welding, burning, cutting, or torch work
- Pouring molten metal (foundries)
- Auto body repair work
- Working at a firing range
- Making batteries
- Making paint or pigments
- Painting
- Salvaging metal or batteries
- Making or splicing cable or wire
- Creating explosives or ammunition
- Making or repairing jewelry
- Making pottery
- Making stained glass items
- Building or repairing or painting ships
- Working in a chemical plant, a glass factory, an oil refinery, or any other work with lead

Resident Questionnaire for Investigation of Children With Elevated Blood Lead Levels (Cont.)

1. Where do adult family members work? (Include mother, father, older siblings, other adult household members.)

Name	Place of employment	Occupation or job title	Probable lead exposure (yes/no)

2. Are work clothes separated from other laundry? ______________________
3. Has anyone in the household removed paint or varnish while in the dwelling? (includes paint removal from woodwork, furniture, cars, bicycles, boats) ______________________
4. Has anyone in the household soldered electric parts while at home? ______________________
5. Does anyone in the household apply glaze to ceramic or pottery objects? ______________________
6. Does anyone in the household work with stained glass? ______________________
7. Does anyone in the household use artist's paints to paint pictures or jewelry? ______________
8. Does anyone in the household reload bullets, target shoot, or hunt? ______________________
9. Does anyone in the household melt lead to make bullets or fishing sinkers? ______________
10. Does anyone in the household work in auto-body repair at home or in the yard? ____________
11. Is there evidence of take-home work exposures or hobby exposures in the dwelling? __________

Assessment: (check)

_____ Probable occupational-related lead exposure

_____ Probable hobby-related lead exposure

Actions: (check)

_____ Counsel family (specify): ______________________________________

_____ Refer to (specify):____

Resident Questionnaire for Investigation of Children With Elevated Blood Lead Levels (Cont.)

Child Behavior Risk Factors

1. Does child suck his/her fingers? yes no (circle)
2. Does child put painted objects into the mouth? yes no (circle)

   If yes, specify: ______
3. Does child chew on painted surfaces such as old painted cribs, window sills, furniture edges, railings, door molding, or broom handles? ______

   If yes, specify: ______
4. Does child chew on putty around windows? ______
5. Does child put soft metal objects in the mouth? These might include lead and pewter toys and toy soldiers, jewelry, gunshot, bullets, beads, fishing sinkers, or any items containing solder (electronics). ______
6. Does child chew or eat paint chips or pick at painted surfaces? Is the paint intact in the child's play areas? ______
7. Does the child put foreign, printed material (newspapers, magazines) in the mouth? ______
8. Does the child put matches in the mouth? (Some matches contain lead acetate.) ______
9. Does the child play with cosmetics, hair preparations, or talcum powder or put them into the mouth? Are any of these foreign made? ______
10. Does the child have a favorite cup? A favorite eating utensil? If yes, are they handmade or ceramic? ______
11. Does the child have a dog, cat, or other pet that could track in contaminated soil or dust from outside? Where does the pet sleep? ______
12. Where does the child obtain drinking water? ______
13. If child is present, note extent of hand-to-mouth behavior observed. ______

Assessment: (check)

______ Child is at risk due to hand-to-mouth behavior.

______ Child is at risk for mouthing probable lead-containing substance (specify): ______

______ Child is at risk for other (specify): ______

Actions:

______ Counsel family to limit access or use of (specify): ______

______ Other (specify): ______

Resident Questionnaire for Investigation of Children With Elevated Blood Lead Levels (Cont.)

Other Household Risk Factors

1. Are imported cosmetics such as Kohl, Surma, or Ceruse used in the home?
   ____
2. Does the family ever use any home remedies or herbal treatments? (what type?) __________
3. Are any liquids stored in metal, pewter, or crystal containers? ______________________
4. What containers are used to prepare, serve, and store the child's food? Are any of them metal, soldered, or glazed? Does the family cook with a ceramic bean pot?
   ____
5. Is the glazing on bathtubs in good condition?
   ____
6. Does the family use imported canned items regularly? ___________________________
7. Does the child play in, live in, or have access to any areas where the following materials are kept: shellacs, lacquers, driers, coloring pigments, epoxy resins, pipe sealants, putty, dyes, industrial crayons or markers, gasoline, paints, pesticides, fungicides, gasoline, gear oil, detergents, old batteries, battery casings, fishing sinkers, lead pellets, solder, or drapery weights? ____

Assessment: (check)

_____ Increased risk of lead exposure due to: ___________________

Actions: (check)

_____ Counsel family to limit access or use (specify): _____________________

_____ Other (specify): ____

Resident Questionnaire for Investigation of Children With Elevated Blood Lead Levels (Cont.)

Assessment for Likely Success of Hazard Control Measures

1. What cleaning equipment does the family have in the dwelling? (circle)

   broom   mop and bucket   vacuum (does it work?)   sponges and rags

2. How often does the family:

   Sweep the floors? ____________________

   Wet mop the floors? ____________________

   Vacuum the floors? ____________________

   Wash the window sills? ____________________

   Wash the window troughs? ____________________

3. Are floor coverings smooth and cleanable? ____________________

4. What type of floor coverings are found in the dwelling? (circle all that apply)

   vinyl/linoleum   carpeting   wood   other (specify) ____________________

5. Cleanliness of dwelling (circle one):

   Code: 1 = appears clean, 2 = some evidence of housecleaning, 3 = no evidence of housecleaning, 4 = ____________, 5 = ____________, 6 = ____________, 7 = ____________

   [Pick the best category based on overall observations of cleanliness in the dwelling.]

   1. Appears clean
   2. Some evidence of housecleaning
   3. No evidence of housecleaning

   No visible dust on most surfaces _____

   Evidence of recent vacuuming of carpet _____

   No matted or soiled carpeting _____

   No debris or food particles scattered about _____

   Few visible cobwebs _____

   Clean kitchen floor _____

   Clean doorjambs _____

   Slight dust buildup in corners _____

Slight dust buildup on furniture _____

Slightly matted and/or soiled carpeting _____

Some debris or food particles scattered about _____

Some visible cobwebs _____

Key Concepts

The purpose of an EBL investigation is to identify a cause or causes for the lead poisoning of a child.

The investigator should 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.

Local regulatory, medical, and other agencies are also involved in the decision-making process regarding hazard control options in cases of lead poisoning of a child.

SECTION 14

OWNER/OCCUPANT RELATIONS

Learning Objectives

After completing this section, the student should be able to

- state the five principles that the risk assessor observes in counseling occupants and/or property owners about the lead-based paint hazards identified through the risk assessment;
- state the three stages at which a risk assessor might conduct educational activities;
- recognize what type of counseling is appropriate in the context of the risk assessment;
- state the three principles of successfully communicating sensitive information to property owners and/or occupants;
- state whose responsibility it is to disclose the results of a risk assessment.

Introduction

The successful control of identified hazards depends largely upon how well the significance and implications of these hazards are understood by owners and/or occupants. Therefore, a successful risk assessor will also need to be skilled in risk communication.

This section will focus primarily on two areas: the educational roles and responsibilities of the risk assessor about specific lead hazards identified in the risk assessment and in providing more general information about lead poisoning prevention. The ultimate goal of conducting risk assessments and hazard control is the prevention of lead poisoning in young children.

Roles and Responsibilities of the Risk Assessor

Although a risk assessor provides services designed to promote the goals of public health and may even be licensed by a state public health agency, the risk assessor is not a public health official. Rather, the risk assessor is a businessperson whose primary responsibility is to the client (usually a property owner or insurance company). The risk assessor is not required to provide the property owner with general information about lead poisoning and its prevention beyond the scope of the risk assessment; nor is the risk assessor required to provide any information, education, or counseling to occupants of a building where a risk assessment has been conducted. In fact, contract law may restrict the ability of the risk assessor to provide information to building occupants, except in cases where they are actually the client. (For the purposes of this section, it is assumed that the property owner will always be the client). The fact remains, however, that the risk assessor is the person best qualified to provide essential information and to respond to concerns and questions arising in conjunction with, or even as a result of, the risk assessment.

Effective communication among risk assessors, property owners, and occupants serves a dual purpose. Helping occupants and owners understand the causes and effects of lead poisoning and possible sources of lead in the environment will give parents the information they need to take an active role in preventing the lead poisoning of their own children. At the same time, well-educated occupants and owners can work with the risk assessor by shedding light on issues affecting the conduct of the risk assessment, such as maintenance or usage histories or unique sources of environmental contamination.

There are three stages of the risk assessment at which counseling and education of owners and occupants are appropriate. These stages are

- prior to the risk assessment;
- after the risk assessment but before the implementation of any hazard control measures;
- after the implementation of hazard control measures.

Ideally, the risk assessor will be able to establish effective communication with owners and occupants at each of these stages.

Before the Risk Assessment

Risk assessors should always have the owner's permission to conduct education of occupants. Disclosure of risk assessment results is the owner's responsibility, not the risk assessor's. This understanding of responsibilities should be determined before risk assessment.

After Risk Assessment/Before Hazard Control

After the risk assessment has been conducted but before hazard control measures have been implemented, communication serves to inform the owner and/or the occupants of the existence of specific hazards and the selected options for addressing these hazards.

The risk assessor is required to provide certain information to the property owner: interpreting the risk assessment forms; understanding the location and relative risk of identified and suspected hazards; recognizing the differences and relationships between interim controls and abatement measures; and understanding any training or licensing requirements and occupancy restrictions associated with particular interim control or abatement options. In addition to this required information, the risk assessor should also be knowledgeable about available financial resources that may exist for the property owner to pursue and be prepared to make referrals.

Since much of the information given to the property owner at this stage is directly relevant to the occupants, the risk assessor should recommend sharing the information with them. Although the owner may choose to transmit this information directly, the risk assessor should educate the owner about the importance of combining risk identification messages with methods of coping with those risks, i.e., how the risks will be controlled. For instance, it is essential that occupants follow any occupancy restrictions during the hazard control work. In addition, occupants will be better able to protect their children if they know where the hazards are, how serious the hazards are, and what the pathway of exposure typically associated with each hazard is.

The risk assessor may be able to recommend some measures that can be implemented by the occupants that will immediately reduce the potential for exposure. Recommendations could include such simple measures as (but not limited to) the following: blocking access to deteriorated paint by moving furniture in front of a deteriorated area or covering the area with duct tape or contact paper; blocking access to deteriorated window surfaces and leaded dust in window troughs by opening the windows from the top rather than from the bottom sashes; wet cleaning surfaces frequently; following basic safety precautions prior to engaging in renovation or remodeling activities; keeping a floor mat at each entrance way so that exterior leaded dust or soil is not tracked into the home; encouraging children to wash their hands frequently and keep their fingers out of their mouths; feeding children diets low in fat and high in calcium and iron; flushing lines before using tap water and always using cold water for drinking or cooking; and discussing regular lead screening with children's pediatricians.

Finally, the risk assessor may want to provide guidance on legal rights and responsibilities of owners and occupants to both parties, even though

After Risk Assessment/ Before Hazard Control

most issues may be beyond the scope of normal risk assessment activities. It is important for owners and occupants to know

- if owners are under legal mandates to complete certain types of work within specified time frames;
- whether owners are required to provide alternative housing for tenants displaced while hazard control activities are being conducted;
- whether the hazards identified by the risk assessor constitute violations of a state or local health or building code;
- whether a tenant has the right to oversee activities going on in the dwelling in which that tenant resides.

Although the risk assessor is not qualified to dispense legal advice, most of these questions will need to be answered before hazard control options can be carried out in a housing unit.

After Hazard Control

It is important for owners and occupants to understand their ongoing responsibilities once hazard reduction measures have been implemented. The risk assessor should:

1. Review the initial risk assessment report with the owner and show when certain reevaluations and ongoing monitoring should be done. Which measures are designed to be short-term, and which are designed to be permanent?
2. Provide general guidance for handling new hazards or the failure of hazard control measures. Discuss general maintenance and repair activities that should be implemented. Can the owner perform all necessary activities, or is a trained/licensed person recommended?
3. Clarify the roles of owners and occupants in ongoing monitoring and maintenance. What processes can be agreed upon by the owner and occupants for the occupants to report failures and for the owner to perform preventive monitoring and maintenance?
4. Counsel owners and occupants about precautions that should be taken when owners or occupants move furniture or perform decorating activities such as repainting or hanging pictures and curtains. Caution them against introducing new sources of lead into a safe environment, such as by bringing dust home on work or hobby clothes or by bringing home recycled or antique painted furniture or other household items unless they are checked for lead first.

Effective Communication

The risk assessor must balance the duty to the client with the goal of promoting public health. In addition, the risk assessor must

- separate information that is required to be given from that which is merely recommended;
- explain detailed technical information in a way that can be understood by the layperson;
- break down the cultural, linguistic, and emotional barriers that prevent the effective transfer of information.

The first step in this process involves making a "connection" with the property owner. The diligence with which the owner will implement the hazard control plan and later perform preventive monitoring and maintenance will depend largely upon the messages the owner receives from the risk assessor. In addition, all of the occupant counseling is subject to the approval of the property owner. Therefore, the risk assessor should try to determine what is motivating the property owner to have a risk assessment conducted in the first place. Is the owner being required to conduct a risk assessment by a regulatory agency, perhaps because of the presence of a lead-poisoned child? Is the owner being required to conduct the risk assessment by a bank, mortgage company, or insurance company? Is the owner concerned about potential liability? Is the owner concerned about the health of the occupant children? Does the owner believe that implementing hazard reduction measures will add to the value of the property? Answering these questions allows the risk assessor to provide information in a manner in which the owner is most likely to be receptive to it. Of course, the information that must be given will be the same, but the way in which the information is presented may be tailored to match the primary concerns of the owner.

For example: The property owner expresses concerns over liability as the primary reason for the risk assessment. The risk assessor can then take the opportunity to summarize the owner's legal responsibilities, if applicable. Of course, the best way to avoid liability is to make sure that no child becomes lead-poisoned. Therefore, the owner should take necessary measures to control lead hazards in the home and should adopt a regular monitoring and maintenance program to ensure that the housing unit continues to be free of lead hazards over the long term. In addition, it is to the owner's advantage that the occupants be well-educated about lead sources and exposure pathways, so that they can work in partnership with the owner to prevent lead poisoning in their own children.

For occupants, the primary concern will usually be the possible health effects of lead on their children. The risk assessor is faced with the challenge of providing accurate information regarding risks in the home without alarming the occupant. The risk assessor should present information regarding identified risks in the home in conjunction with simple measures which can be implemented immediately to help lower the risk.

Risk assessors will find that some owners and occupants do not seem to be receptive to the information being given, even when the information is being presented in a manner that reflects their primary concerns. Owners and occupants not receptive to information at one stage of the process may become more receptive at a different stage. Therefore, it is important that the risk assessor attempt to perform counseling at each stage of the process, even if previous attempts were unsuccessful. It is also possible that the seemingly unreceptive owner or occupant is just not understanding the message being sent.

Of course, there will be times when language barriers hinder effective communication between the risk assessor and the owner or occupant. The risk assessor should refer the person to the local lead poisoning prevention program, where basic written information is often available in different languages and at low literacy levels.

Whenever property owners and occupants are both trying to assert their rights at the same time, conflict may result. It is not uncommon for tenants to blame a property owner for what is perceived to be deficient maintenance and upkeep; at the same time, an owner may be resentful that the tenant is not shouldering a larger share of the responsibility in addressing lead hazards, especially when it is being done for the benefit of the tenant's child. Often, discussions take on emotional overtones. The property owner may be torn between the desire to implement "the best" hazard control measures and the reality of financial considerations; the occupants may feel that the health of their child is being jeopardized to save a few dollars.

It is very common for property owners and occupants to blame each other for a problem which is in fact a problem facing all of society. Fortunately, education can be very effective in such cases. One common complaint from owners is that "Good parents watch their kids and don't allow them to eat paint chips." The risk assessor, through educating the owner about the role of normal hand-to-mouth activity in young children and the resulting ingestion of leaded dust, can help dispel the myth that only children of bad parents become lead-poisoned. On the other side, tenants often complain that a property owner who owns a house with lead paint is a "slumlord." The role of the risk assessor here is to help the occupant understand the pervasive use of leaded paints for over 100 years in millions of dwellings and that often the better-maintained properties were the most highly leaded. In addition, the mere fact that the owner is having a risk assessment performed indicates the willingness of the owner to "do the right thing."

Effective Communication

Of course, education will not be effective in all cases. The risk assessor should implement five principles:

- not take sides
- not lay blame
- not incite unreasonable fears
- not minimize legitimate concerns
- not impose nonexistent responsibilities

Rather, the risk assessor should provide factual, useful, and unbiased counseling to both parties.

Successful education of owners and occupants will often be a difficult and time-consuming process for the risk assessor. In many cases, the risk assessor will be frustrated that only partial education can be achieved. In the end, however, the degree to which a risk assessor can step beyond the narrowly defined technical role of consultant and into the broader role of educator to promote the concept of joint responsibility between owner and occupant, the more successful the efforts to prevent lead poisoning will prove to be.

Key Concepts

The risk assessor is the person best qualified to provide essential information and to respond to concerns and questions arising in conjunction with, or even as a result of, the risk assessment.

There are three stages of the risk assessment at which counseling and education of owners and occupants are appropriate:

- prior to the risk assessment;
- after the risk assessment but before the implementation of any hazard control measures;
- after the implementation of hazard control measures.

The risk assessor must balance the duty to the client with the goal of promoting public health:

- separate information that is required to be given from that which is merely recommended;
- explain detailed technical information in a way that can be understood by the layperson;
- break down the cultural, linguistic, and emotional barriers that prevent the effective transfer of information.

Of course, education will not be effective in all cases. The risk assessor should implement five principles:

- not take sides
- not lay blame
- not incite unreasonable fears
- not minimize legitimate concerns
- not impose nonexistent responsibilities

SECTION 15

Report Preparation

Learning Objectives

After completing this section, the student should be able to

- name the four major functions of the risk assessment report;
- name at least 20 parts of the standard risk assessment report format;
- state the duty a risk assessor must complete in presenting hazard control options to an owner.

Introduction

The report of the risk assessment work performs several functions:

- summarizes the results by indicating where hazards were found;
- indicates the range of hazard control options likely to be effective (including ongoing monitoring and maintenance for each option);
- includes all raw data and identifying information;
- in some jurisdictions, may become a legal document.

Report Format

Examples of two risk assessment reports are provided in Appendix A and Appendix B of this manual and in Chapter 8 of the HUD *Guidelines*. The first deals with a single family house, while the second addresses a multi-family housing situation.

The standard report format outlined in the HUD *Guidelines* is as follows:

Part I: Identifying Information

Identity of dwelling(s) covered by report, identity of property(ies).

1. Risk Assessor, Name of Certificate (or License) and Number and State issuing certificate/license.
2. Property Owner Name, Address, and Phone Number.
3. Date of Report, Date of Environmental Sampling.

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

4. List of Location and Type of Identified Lead Hazards.
5. Optional Management Information (Form 5.6) (not required for homeowners).
6. Maintenance/Paint Condition Information (Form 5.2 or 5.7).
7. Building Condition (Form 5.1).
8. Brief Narrative Description of Dwelling Selection Process (not required if all dwellings were sampled).
9. Analysis of Previous XRF Testing Report (if applicable).
10. Deteriorated Paint Sampling Results (Form 5.3 or 5.3a).
11. Dust Sampling Results (Form 5.4 or 5.4a).
12. Soil Sampling Results (Form 5.5).
13. Other Sampling Results (if applicable).

Part III. Lead Hazard Control Plan

14. Lead-based Paint Policy Statement (not applicable for homeowners).
15. Name of Individual in Charge of Lead-based Paint Hazard Control Program.
16. Recommended Changes to Work Order System and Property Management (optional, not applicable for homeowners or property owners without work order systems).
17. Acceptable Interim Control Options and Estimated Costs.

Report Format

18. Acceptable Abatement Options and Estimated Costs.
19. Reevaluation Schedule for each option (if applicable).

The information outlined above should be presented to the owner for consideration. The risk assessor should explain the various hazard control options and answer any questions that might arise. With or without the help of the risk assessor, the owner must decide which hazard control option is most appropriate. The final report for the owner should include the following information:

20. Interim Control/Abatement to Be Implemented in This Property.
21. A Training Plan for Managers, Maintenance Supervisors, and Workers (this should include named individuals), if applicable.
22. Method of Resident Notification of Results of Risk Assessment and Lead Hazard Control Program (not applicable for homeowners). Note: This section should include a discussion of how residents are to be educated about lead poisoning, before the risk assessment results are released.
23. Signatures (Risk Assessor) and Date.

Subject to federal and local laws and regulations, a certificate of lead-based paint hazard compliance (with an expiration date based on the Reevaluation Schedule may be provided by the risk assessor (or local enforcement agency) following the successful implementation of the accepted interim control or abatement method(s) and any associated clearance sampling.

Single-family and Multi-family Housing

Some parts of the report format only apply to multi-family housing or to owners who have maintenance staffs and not to single-family housing. These include the following:

- Optional Management Information
- Brief Narrative Description of Dwelling Selection Process (not required if all dwellings were sampled)
- Lead-based Paint Policy Statement
- Name of Individual in Charge of Lead-based Paint Hazard Control Program
- Recommended Changes to Work Order System and Property Management (optional, not applicable for homeowners or property owners without work order system)
- Method of Selecting Units (random, worst-case, or targeted)—targeted sampling is the most widespread method of selecting units in multi-family housing.

Understanding the Owner's Needs

Owners will vary considerably in the extent of the knowledge they will need. Some will require a considerable degree of help in understanding and selecting their control options if hazards are found. Others will require little more than a written identification of where hazards are located and whether the hazards are paint, soil, or dust related.

Risk assessors will need to gauge the extent of consultation any given owner will require before taking on any given project.

Risk assessors may list which hazard control options will work and which will not on any given surface. However, it is the risk assessor's duty to inform the owner that it is the owner's responsibility to make the final choice on a course of action. This will minimize the risk assessor's liability. The final report should always contain a clear description of the owner's duties with regard to abatement or interim control of identified hazards.

The risk assessor also has responsibilities to the public and the occupant(s). These responsibilities may include education, explaining why tests are being done, and presenting to the owner a **wide** range of control options, including both interim controls and abatement. Disclosure of results to an occupant is usually the duty of the owner and/or the local public health authorities, not the risk assessor.

Important Parts of the Risk Assessment Report

As an example of the information contained in the report, let's look at an example of a summary for a report.

Summary

A lead-based paint risk assessment was conducted at 1234 Main Street, in Anywhere, Any State 30000 for Mr. Joseph H. Smith, Owner, who is located at 4444 Podunck Way, Anywhere, Any State 30000 (400-777-7777) on 1 April 1994. The risk assessment was conducted by Michael L. Hazard, a Certified Risk Assessor (Any State License No. 94-567).

While the building and its paint are in relatively good condition overall, the risk assessment showed that lead-based paint hazards exist in the following locations:

- deteriorated lead-based paint on the exterior of the windows;
- leaded dust on the floor of Bobby's bedroom (the southeast bedroom on the second floor);
- deteriorated lead-based paint on the interior door leading to Bobby's bedroom (the southeast bedroom).

These hazards should be controlled as soon as possible.

A few other painted surfaces that have not been tested for lead are in "fair" condition and should be repainted within the next year before further deterioration occurs. Those surfaces are:

- exterior doors;
- exterior railings;
- all interior doors (except the bedroom door to the southeast bedroom, which is in poor condition and required repair immediately);
- interior window trim;
- stairways;
- bathroom cabinets.

Since vacancies occur frequently in this property, these surfaces can be repainted at that time. Before any scraping or sanding, the paint should be tested to see if it contains lead. The paint on the porch floor is in poor condition; but since it does not contain lead-based paint, it does not require priority attention.

There has not been any previous lead-based paint testing at this dwelling, although a lead-based paint inspection of all painted surfaces is recommended so that potential lead problems can be monitored before

Important Parts of the Risk Assessment Report

they become hazardous. Following the EPA/HUD risk assessment protocol, soil samples were all below 400 µg/g. Based on current EPA guidance levels, no soil lead hazards were identified.

Controls

The owner has decided to select the following hazard control measures, which are all acceptable based on HUD's 1995 *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*:

- stabilize the paint on the exterior of all the windows;
- remove the leaded dust located in the child's bedroom;
- replace the door leading to the southeast second floor bedroom.

Mr. Smith has chosen to use interim controls for the windows until 1997, when the State of Any State is likely to begin a special loan fund for financing lead-based paint abatement that should make window replacement financially possible. Mr. Smith will also make sure that the part-time as-needed maintenance worker he uses will be trained. Certain property management practices will be adopted so that the normal repair work done will not disturb those surfaces with lead-based paint.

After the cleaning and paint film stabilization work has been completed, clearance dust samples must be taken so that it is certain that the dwelling is lead-safe before the family moves back in to the room.

Reevaluation

The normal reevaluation schedule for the interim control measures used in this property is two years. Because existing dust levels were not more than 10 times the HUD Interim Standards, the dwelling should be reevaluated in September 1996 (24 months from now).

Mr. Smith has agreed to share the results of this report with the Jones family, which now occupies the residence, and to provide the family with the EPA brochure and a brochure from the Anywhere Childhood Lead Poisoning Prevention Program as a way of educating the residents.

Key Concepts

The four functions of the final risk assessment report are that it

- summarizes the results by indicating where hazards were found;
- indicates the range of hazard control options likely to be effective (including ongoing monitoring and maintenance for each option);
- includes all raw data and identifying information;
- in some jurisdictions may become a legal document.

The 23 sections of a standard risk assessment report are provided in Section 15 of this model curriculum.

The duty a risk assessor must discharge with an owner is to make it clear that the choice of how to control the hazard is up to the owner, not the risk assessor.

SECTION 16

Risk Assessment Exercises

Exercise #1—Preliminary Contact with the Owner

You just returned to your office and found a telephone message from a nervous landlord. This person just read about a successful lawsuit from a lead-poisoned child against a local landlord and wants you to test all properties to see "if there is a problem with lead-based paint in my 35 houses."

Working in small groups, develop a list of no more than 10 questions you would want to ask this landlord in order to determine the landlord's expectations and constraints and whatever background information you deem necessary to know before committing to do any work or give any advice.

Exercise #2—Hazard Control

A risk assessment was performed in a single-family home that will probably be substantially renovated in three years when the owner will get a state-subsidized loan. Until then, the owner has little money to invest in the property. The visual assessment showed that paint was cracked in nearly all window troughs, and paint was deteriorated on the porch trim. Water stains were evident on the ceiling of the child's bedroom, but the paint was in good condition. All other interior paint was rated in good condition.

Instructions: Working individually, use the environmental sampling results given below to answer the following questions.

1. What additional information is needed to make an informed judgment?
2. Where are the lead-based paint hazards located?
3. What specific recommendations would you make to the owner about actions to take to control the hazards at this location?

Room 1: Floor—38 µg per square foot

Sill—105 µg per square foot

Trough—10,580 µg per square foot

Room 2: Floor—45 µg per square foot

Sill—<25 µg per square foot

Trough—108,000 µg per square foot

Room 3: Floor—<25 µg per square foot

Sill—78 µg per square foot

Trough—805 µg per square foot

Bare soil from play area: 3,589 µg/g

Bare soil from foundation: 1,280 µg/g

Paint chip from porch trim: 0.8 percent Pb by weight

Paint chip from exterior window trough: 0.03 percent Pb by weight

Exercise #3—Hazard Control

A risk assessment was performed for ten dwellings in an apartment building containing 50 units. The dwellings were sampled based on worst-case criteria. The owner indicated that he plans to retain the building for some time but wants to "get this lead problem out of the way." The visual assessment showed that paint was peeling from bathroom and kitchen ceilings and was cracked in both window sills and window troughs. Paint on the railing in the common area was also cracked, but not peeling. Composite dust samples were collected from floors, sills, and troughs in each unit. Results are presented below in micrograms per square foot.

Unit #	Floor Dust	Sill Dust	Trough Dust
1	38	508	895
2	75	1,297	3,927
3	45	3,925	10,987
4	67	309	401
5	109	475	3,978
6	<25	610	795
7	<25	819	2,098
8	42	2,675	5,095
9	29	495	798
10	32	450	5,870

The building foundation was completely paved; thus, no soil samples were collected. The only nearby play area was a public playground. Local authorities indicated they had no information on soil levels in the playground. The owner gave permission to analyze a single soil composite sample from the playground. The result was 4,097 µg/g.

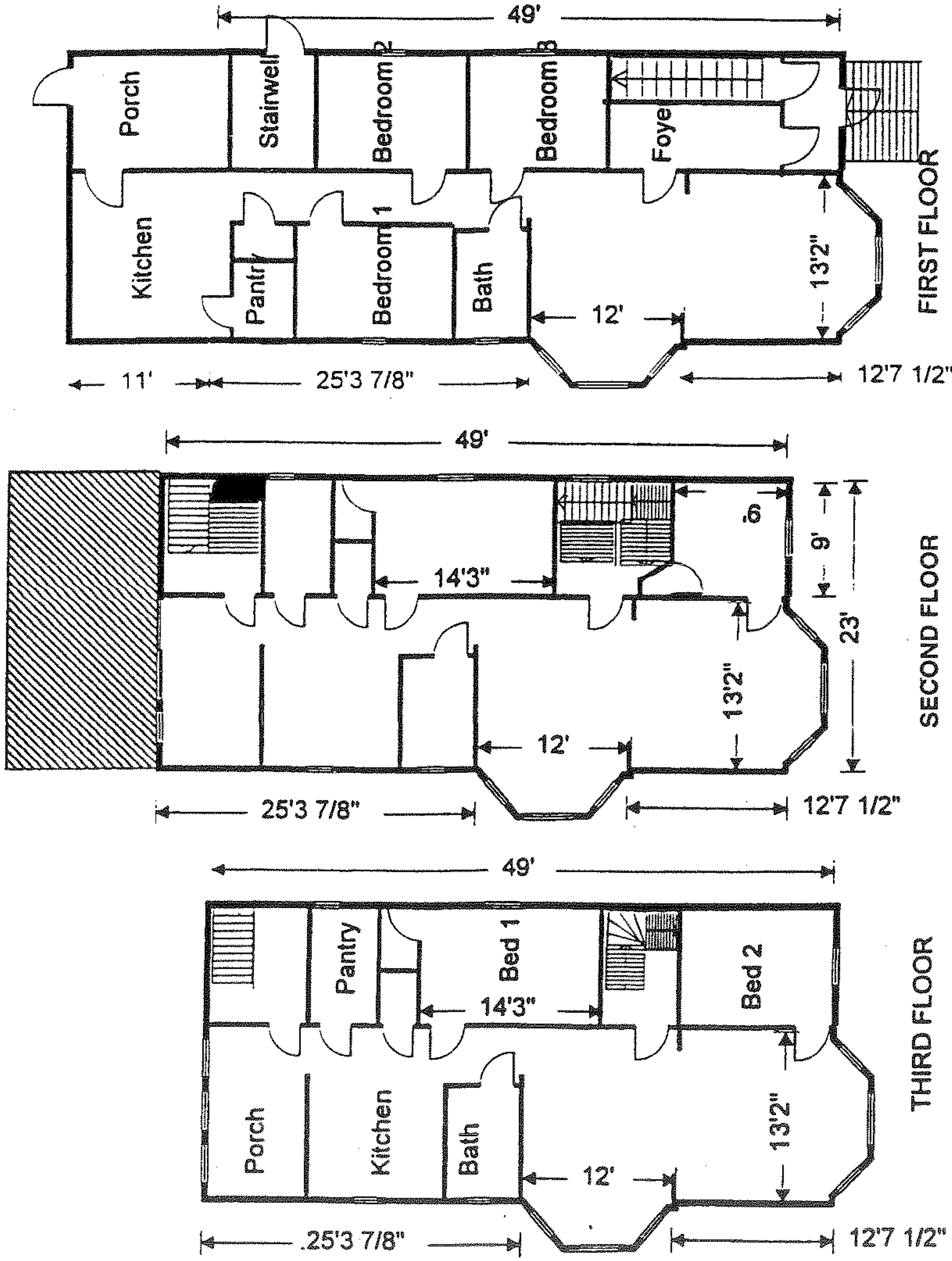
Paint chips were collected from all deteriorated surfaces, and all were found to be above the local standard of 600 ppm but below the federal standard of 5,000 ppm.

Instructions: Using the information provided above, provide answers to the following questions.

1. What additional information is needed to make an informed judgment?
2. Where are the lead hazards located?
3. What specific recommendations would you make to the owner about actions to take to control the hazards at this location?

Exercise #4—Sampling Exercise

A three-story six-unit frame house was built in 1910. Three of the units in the building are detailed below; the other three units are mirror images of the three in the diagram.



The yard size is 50 feet by 10 feet in front and 50 feet by 20 feet in back. The lawn is poorly maintained. Common areas include a front entrance; carpeted front stairwell and landing; back stairwell; and basement laundry room.

You are asked by the building owner to perform an evaluation of lead hazards in the building described above and in the attached diagram. Several families with young children live in the building. The owner is particularly concerned about lead hazards to the children. He expects to keep the building for some time, and the structural condition is good for the building's age. He has little capital for investment other than limited renovations during occupancy turnover. You would like to please the owner, given the possibility of more business in this or other properties.

Assuming there are two options, a comprehensive lead paint inspection or a risk assessment, determine the costs for each. Give cost estimates per unit for the inspection and the risk assessment separately, assuming that: labor is worth \$50/hour for a risk assessor or \$25/hour for a technician, you have an XRF analyzer available to rent for \$100/day, and all laboratory analyses cost \$15 each. The pricing includes overhead costs.

For the comprehensive lead inspection, determine the number of representative surfaces that should be tested in each unit. Assume that each surface requires a minimum of one minute to test and record. Don't forget to add common area sampling.

For the risk assessment, what type of environment sampling would you do, and how many samples/analyses of each type would you perform? Fill out the table on the next page to **estimate** inspection and risk assessment costs in the unit. Include sampling in common areas. For the risk assessment, the use of composite sampling is up to your discretion.

Be prepared to defend your approach.

What protocol should you follow in selecting the number of units for each activity? The owner wants you to give him documentation of lead-safe status for insurance purposes. ______________________________

What other information would you like to obtain from the owner? _______
____
____

Exercise provided courtesy of Salvatore Cali, University of Illinois at Chicago, School of Public Health.

Lead Inspection/Risk Assessment Worksheet

	Comprehensive Inspection		Risk Assessment	
	Estimated Number of Samples	Estimated Cost	Estimated Number of Samples	Estimated Cost
XRF assays				
Lab analysis				
Settled dust sampling				
Soil sampling				
Air sampling				
Water sampling				
Walk-through data collection and report preparation time				
Total costs				

Exercise #5—Multifamily Housing

Problem:

You are conducting a risk assessment for Reese Company Properties. Reese owns a 25-unit building at 255/257 Polk Avenue and owns some scattered-site rental units on Jefferson and Monroe Streets. The buildings on Polk Avenue have similar units, some two bedrooms and some three bedrooms. It is assumed that all units in the building have had a similar painting history. The dwelling units on Jefferson and Monroe are all two-story walk-ups built in the same era. The units on Jefferson and Monroe have been owned by many different owners, however, and their painting histories are not that clear.

From your preliminary data collection from the owners, you gathered the information found below and on the next page. Use this information to determine which dwelling units will be sampled by your firm.

List the units to be tested below:

________ ________ ________ ________ ________

________ ________ ________ ________ ________

________ ________ ________ ________ ________

________ ________ ________ ________ ________

________ ________ ________ ________ ________

________ ________ ________ ________ ________

Apt #	Number of Children Under 6	Serves as a Daycare?	Code Violations	Chronic Maintenance Problems	Recently Prepared for Reoccupancy
1881 Monroe	?	✔			
1893 Monroe	Vacant			✔	✔
507 Jefferson	2		✔	✔	
525 Jefferson	1				
527 Jefferson	?				

Apt #	Number of Children Under 6	Serves as a Daycare?	Code Violations	Chronic Maintenance Problems	Recently Prepared for Reoccupancy
255-001	0				
255-101	3				
255-102	1				
255-103	?				
255-104	3				
255-201	2				
255-202	?				
255-203	1				
255-204	3				
255-301	Vacant			✔	
255-302	?			✔	
255-303	?				
255-304	2				
257-101	2 (1 EBL)				
257-102	?				
257-103	3		✔		
257-104	?				
257-201	1				
257-202	3				
257-203	?		✔	✔	
257-204	?				
257-301	2			✔	
257-302	1				
257-303	Vacant				✔
257-304	?				

Pb

APPENDIX A

Example of a Risk Assessment Report

Example of a Risk Assessment Report for a Single-Family Dwelling Operated by a Small-Scale Owner

Part I: Identifying Information:

Lead-Based Paint Risk Assessment Report

For The Dwelling Located at:

1234 Main St.
Anywhere, Any State 30000

Prepared For:

Mr. Joseph H. Smith, Owner
4444 Podunck Way
Anywhere, Any State 30000
400-777-7777

By:

Michael L. Hazard, Certified Risk Assessor
5678 Snowflake St.
Anywhere, Any State 30000
400-333-3333

Any State License No. 94-567

April 19, 1994

Table of Contents

Summary

A lead-based paint risk assessment was conducted at 1234 Main St. in Anywhere, Any State 30000 for Mr. Joseph H. Smith, Owner, who is located at 4444 Podunck Way, Anywhere, Any State 30000 (400-777-7777) on April 1, 1994. The risk assessment was conducted by Michael L. Hazard, a Certified Risk Assessor (Any State License No. 94-567).

While the building and its paint are in relatively good condition overall, the risk assessment showed that lead hazards exist in the following locations:

1. Deteriorated lead-based paint on the exterior side of the windows.

2. Leaded dust on the floor of Bobby's bedroom (the southeast bedroom on the second floor).

3. Deteriorated lead-based paint on the interior door leading to Bobby's bedroom (the southeast bedroom)

A few other painted surfaces that have not been tested for lead are in "fair" condition and should be repainted within the next year before further deterioration occurs. Those surfaces are:

- Exterior Doors
- Exterior Railings
- All Interior Doors (except the bedroom door to the southeast bedroom, which is in poor condition and requires repair immediately)
- Interior window trim
- Stairways
- Bathroom cabinets

Since vacancies occur frequently in this property, these surfaces can be repainted at that time. Before any scraping or sanding, the paint should be tested to see if it contains lead. The paint on the porch floor is in poor condition, but since it does not contain lead-based paint, it does not require priority attention.

There has not been any previous lead-based paint testing at this dwelling, although a lead-based paint inspection of all painted surfaces is recommended so that potential lead problems can monitored before they become hazardous. Soil lead levels were all below 400 µg/g (below the HUD and EPA interim levels of 400 µg/g for high contact areas and 2,000 µg/g for areas children are not likely to contact) and are not a hazard.

The owner has decided to select the following hazard control measures, which are all acceptable based on HUD's 1995 Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing:

- stabilize the paint on the exterior of all the windows
- remove the lead dust located in the child's bedroom
- replace the door leading to the southeast second floor bedroom

Mr. Smith has chosen to use interim controls for the windows until 1997, when the State of Any State is likely to begin a special loan fund for financing lead-based paint abatement that should make window replacement financially possible. Mr. Smith will also make sure that the part-time as-needed maintenance worker he uses will be trained. Certain property management practices will be adopted to ensure that the normal repair work done will not disturb those surfaces with lead-based paint.

After the cleaning and paint film stabilization work has been completed, clearance dust samples must be taken to make certain that the dwelling is lead-safe before the family moves back in to the room.

Reevaluation: The normal reevaluation schedule for the interim control measures used in this property is 12 months. Because this building is in good condition and existing dust levels were not more than 10 times the HUD Interim Standards (and also because the owner is making a sincere attempt to control lead hazards), the dwelling meets the criteria for an extension to 18 months. Therefore, the dwelling should be reevaluated in September 1995 (18 months from now).

Mr. Smith has agreed to share the results of this report with the Jones family, which now occupies the residence and to provide the family with the EPA brochure and a brochure from the Anywhere Childhood Lead Poisoning Prevention program as a way of educating the residents.

Form 5.0
Resident Questionnaire

Children/Children's Habits

1. (a) Do you have any children that live in your home? Yes __X__ No _____
   (b) If yes, how many? __2__ Ages? __1___ __3___ _____ _____ _____
   (c) Record blood lead levels, if known_____ _____ _____ _____ _____

IF NO CHILDREN, SKIP TO Q.5

2. Locate the rooms/areas where each child sleeps, eats, and plays.

Name of Child	Location of Bedroom	Location of All Rooms Where Child Eats	Primary Location Where Child Plays Indoors	Primary Location Where Child Plays Outdoors
Bobby	Southeast - Second Floor	Kitchen	Living Room	Back Yard Under Jungle Gym
Jennifer	Southwest - Second Floor	Kitchen	Living Room	Back Yard Under Jungle Gym

3. Where are toys stored/kept? ____Living Room________________________________
4. Is there any visible evidence of chewed or peeling paint on the woodwork, furniture, or toys?
   Yes _____ No __X__

Family Use Patterns

5. Which entrances are used most frequently? ___Front Door______________
6. Which windows are opened most frequently? ___Living Room______________
7. Do you use window air conditioners? If yes, where? _____No____X________
   (Condensation often causes paint deterioration)
8. (a) Do any household members engage in gardening? Yes _____ No __X__
   (b) Record the location of any vegetable garden. __No garden_______________
   (c) Are you planning any landscaping activities that will remove grass or ground covering? Yes_____ No __X__
9. (a) How often is the household cleaned? once/week
   (b) What cleaning methods do you use? mopping and sweeping
10. (a) Did you recently complete any building renovations? Yes _____ No __X__
    (b) If yes, where?_________________
    (c) Was building debris stored in the yard? If Yes, Where?_______________
11. Are you planning any building renovations? Where? _______No__________
12. (a) Do any household members work in a lead-related industry? Yes _____ No __X__
    (b) If yes, where are dirty work clothes placed and cleaned?________________

Form 5.6
Management Data For Rental Dwellings

Part 1: Identifying Information

Identifying Information:

Name of Building or Development: Not Applicable
Number of Buildings: ____1_____
Number of Individual Dwelling Units/Building: ____1__
Number of Total Dwelling Units: ___1____
Date of Construction: 1937
Date of Substantial Rehab, if any: None

List of Addresses of Dwellings (attach list if more than 10 dwellings are present)

Dwelling No.	Address	No. Children Aged 0 - 6 Years Old	Recent Code Violation Reported by Owner?	Chronic Maintenance Problem?
1	1234 Main St. Anywhere, Any State	2	No	No

Record number and locations of common child play areas (on-site playground, backyards, etc.)

Number 1 Play Structure In Back Yard

Part 2: Management Information

1. List names of individuals who have responsibility for lead-based paint. Include owner, property manager (if applicable), maintenance supervisor and staff (if applicable) and others. Include any training in lead hazard control work (inspector, supervisor, worker, etc.) that has been completed. Use additional pages, if necessary.

   This information will be needed to devise the risk management plan contained in the risk assessor's report.

Name	Position	Training Completed (if none, enter "None")
Joseph Smith	Owner	None
Not Applicable	Property Manager	
Joe Sweat	Maintenance Worker	None

2. Is there a lead hazard control policy statement?
   ______ Yes __X____ No (If yes, attach statement)

3. Has there been previous lead-based paint evaluations?
   _____ Yes ___X____ No (If yes, attach the report)

4. Has there been previous lead hazard control activity?
   ______ Yes ___X___ No (If yes, attach the report)

5. Describe dwelling turnover procedure, including typical cleaning, repainting, and repair activity.

<u>The dwelling has all trash removed after the resident has left. Joe Sweat inspects the dwelling and decides whether repainting is needed or other repairs to building systems are necessary. After performing any repainting or other repairs, the floors are mopped and the kitchen counters and bathrooms cleaned. All other floors are vacuumed.</u>

6. Employee and Worker Safety Plan

   a. Is there an occupational safety and health plan for maintenance workers?
   ______ Yes ___X___ No (If yes, attach plan)

   b. Are workers trained in lead hazard recognition?
   ______ Yes ___X___ No If yes, who performed the training?
   ____

c. Are workers involved in a hazard communication program?
______ Yes ___X___ No

d. Are workers trained in proper use of respirators?
______ Yes ___X___ No

e. Is there a medical surveillance program
______ Yes ___X___ No

7. Is there a HEPA Vacuum available?
______ Yes ___X___ No

8. Are there any on-site licensed or unlicensed day-care facilities.
______ Yes ___X___ No If yes, give location ______________________

9. Planning for Resident Children with Elevated Blood Levels

a. Who would respond for the owner if a resident children with an elevated blood lead level was identified?
The owner

b. Is there a plan to relocate such children?
______ Yes ___X___ No If Yes, Where? ______________________

c. Do you (the owner) know if there ever has been a resident child with an elevated blood lead level?
______ Yes ______ No ___X___Unknown

10. Owner Inspections

a. Are there periodic inspections of all dwellings by the owner?
___X___ Yes ______ No If Yes, how often? Every year or whenever the unit is vacant

b. Is the paint condition assessed during these inspections?
___X___ Yes ______ No

11. Have any of the dwellings have ever received a housing code violation notice?
______ Yes ___X___ No ______ Unknown If yes, describe code violation

____

____

12. If previously detected, unabated lead-based paint exists in the dwelling, have the residents been informed? ______ Yes ___X___ No _____Not Applicable

Form 5.7
Maintenance Data for Rental Dwellings

Condition of Paint on Selected Surfaces

Building Component	Location Notes	Paint Condition (Good, Fair, Poor, or Not Present) To Be Completed by Risk Assessor	Deterioration Due to Friction or Impact?	Deterioration Due to Moisture?	Location of Painted Component with Visible Bite Marks
Building Siding		Good			
Exterior Trim		Good			
Window Troughs		Poor	No	No	
Exterior Doors	S +E sides	Fair	Yes	No	
Railings	Porch	Fair	Yes	No	
Porch Floors		Poor	Yes	No	
Other Porch Surfaces		Good			
Interior Doors		Fair (Door to Southeast Bedroom is Poor)	Yes	No	
Ceilings	Bathroom	Fair		No	
Walls		Good			
Interior Windows		Fair	Yes	No	
Interior Floors		Fair	Yes	No	
Interior Trim		Good			
Stairways		Fair	Yes	No	
Radiator (Or Radiator Cover)		Good			
Kitchen cabinets		Good			
Bathroom cabinets		Fair	Yes	No	
Other surfaces					

If the overall condition of a component is similar throughout a dwelling, that condition should be recorded. If a component in a couple of locations is in poor condition, but the overall condition is good or fair, the specific sites of the badly deteriorated paint should be noted. The specific locations of any component with bite marks should be recorded.

Form 5.7 (continued)

1. Painting Frequency and Methods

   a. How often is painting completed? every ___5___ years

   b. Is painting completed upon vacancy, if necessary?
   __X___ Yes ______ No

   c. Who does the painting? ___X___Property Owner _______Residents
   IF Residents, SKIP to Q.2

   d. Is painting accompanied by scraping, sanding, or paint removal?
   ___X___ Yes ______ No

   e. How are paint dust/chips cleaned up? (check one)
   __X___ Sweeping ______ Vacuum ______ Mopping ______ HEPA/TSP/HEPA

   f. Is the work area sealed off during painting?
   ______ Yes __X___ No

   g. Is furniture removed from the work area?
   ______ Yes ___X___ No

   h. If no, is furniture covered during work with plastic?
   ______ Yes ___X___ No

2. Is there a preventive maintenance program?
   ______ Yes ___X___ No

3. Describe work order system (if applicable, attach copy of work order form)

   There is no formal work order system.

4. How are resident complaints received and addressed? How are requests prioritized? If formal work orders are issued, is the presence or potential presence of lead-based paint considered in the work instructions?

   Resident complaints are received directly by the owner, who then authorizes the maintenance employee to complete the necessary repairs. The presence of lead-based paint is not routinely considered in the repair and maintenance work.

5. Record location of dwellings recently prepared for reoccupancy.

   Not Applicable

Form 5.1
Building Condition Form

Condition	Yes	No
Roof missing parts of surfaces (tiles, boards, shakes, etc.)		X
Roof has holes or large cracks		X
Gutter or downspouts broken or missing	X	
Chimney masonry cracked, bricks loose or missing, obviously out of plumb		X
Exterior or interior walls have obvious large cracks or holes, requiring more than routine painting (if masonry) or painting		X
Exterior siding has missing boards or shingles		X
Water stains on interior walls or ceilings		X
Plaster walls or ceilings deteriorated		X
Two or more windows or doors broken, missing, or boarded up		X
Porch or steps have major elements broken, missing, or boarded up		X
Foundation has major cracks, missing material, structural leans, or visibly unsound		X
Total Number*	1	

If the "Yes" column has 2 or more checks, the dwelling is considered to be in poor condition. Less than 2 checks in the "Yes" column means that the dwelling appears to be well maintained and the Standard Reevaluation Schedule does not need to be revised. Only buildings in "good" condition are eligible for the Lead Hazard Screen.

Notes:

Form 5.3
Field Sampling Form for Deteriorated Paint

Name of Risk Assessor Michael Hazard
Name of Property Owner Joseph Smith
Property Address 1234 Main St, Anywhere Any State 30000 Apt. No.____________

Sampling Protocol __X__All Dwellings _____Targeted _____Worst-Case _____Random
Target Dwelling Criteria (Check All That Apply)
_____ Code Violations
_____ Judged to be in Poor Condition
_____ Presence of 2 or More Children between Ages of 6 Months and 6 Years
_____ Serves as Day-Care Facility
_____ Recently Prepared for Reoccupancy

Sample Number	Room	Building Component	Laboratory Result (µg/g) or XRF Reading (mg/cm^2)
1	Southeast Child's Bedroom (Bobby's Room)	Window Trough Frame	9.2 mg/cm^2 (portable XRF)
2	Front Porch	Floor	0.1 mg/cm^2 (portable XRF)
3	Southeast Child's Bedroom (Bobby's Room)	Interior Door	5.3 mg/cm^2 (portable XRF)
4	Living Room	Window Trough Frame	7.8 mg/cm^2 (portable XRF)
HUD Standard			5,000 µg/g or 1 mg/cm^2

Sample all layers of paint, not just deteriorated paint layers
Total Number of Samples This Page___4_____
Page ____1____ of ____1_____
Date of Sample Collection_4___/_1___/_94___ Date Shipped to Lab_4___/__1__/__94__
Shipped by ________________________ Received by ____________________________________
(signature) (signature)
Date Results Reported _4___/_10___/_94___
Analyzed by___Lisa Baker______________________
Approved by___Jim Zimmerman____________________

Form 5.4
Field Sampling Form For Dust
(Single Surface)

Name of Risk Assessor _____Michael Hazard____________________
Name of Property Owner _____Joseph Smith____________________
Property Address _1234 Main St, Anywhere, Any State______ Apt. No.____________

Dwelling Selection Protocol __X__ All Dwellings _____ Targeted _____ Worst-Case _____ Random
Target Dwelling Criteria (Check All That Apply)
_____ Code Violations
_____ Judged to be in Poor Condition
_____ Presence of 2 or More Children between Ages of 6 Months and 6 Years
_____ Serves as Day-Care Facility
_____ Recently Prepared for Reoccupancy

Sample Number	Room (Record Name of Room Used by the Owner or Resident)	Surface Type	Is Surface Smooth and Cleanable?	Dimensions[1] of Sample Area (inches x inches)	Area (ft^2)	Result of Lab Analysis ($\mu g/ft^2$)
1	Play Room Living Room	Floor	Yes	_12_ x _12_	1	79
2	Play Room Living Room	Interior Window Sill	Yes	_3__ x _33_	0.69	150
3	Kitchen ________	Floor	Yes	_12_ x _12_	1	<25
4	Kitchen ________	Window Trough	No	_3__ x _25_	0.52	579
5	Bedroom 1 Bobby (Southeast)	Floor	No	_12_ x _12_	1	1,356
6	Bedroom 1 Bobby (Southeast)	Interior Window Sill	No	2.5 x 34	0.59	400
7	Bedroom 2 Jennifer (Southwest)	Floor	Yes	12 x 12	1	129
8	Bedroom Jennifer (Southwest)	Window Trough	No	3 x 33	0.69	600
9	Blank					<25

[1] Measure to the nearest 1/8 inch

Total Number of Samples This Page____9____
Page ___1______ of ____1_____
Date of Sample Collection__4__/__1__/_94_ Date Shipped to Lab__4__/_4___/_94___
Shipped by ________________________________ Received by ________________________
(signature) (signature)

HUD Standards: 100 $\mu g/ft^2$ (floors), 500 $\mu g/ft^2$ (interior window sills), 800 $\mu g/ft^2$ (window troughs)

Form 5.5
Field Sampling Form For Soil
(Composite Sampling Only)

Name of Risk Assessor ____Michael Hazard______________________
Name of Property Owner ___Joseph Smith_______________________
Property Address _1234 Main St. Anywhere, Any State__________________________

Sample No.	Location	Bare or Covered	Lab Result (µg/g)
1	Building Perimeter	Bare	222
	Building Perimeter		
2	Play Area 1 (describe) Back Yard Jungle Gym	Bare	102
	Play Area 2 (describe) ___________		

Collect only the top ½" of soil

Total Number of Samples This Page____2____
Page ___1______ of ____2_____
Date of Sample Collection__4__/__1__/__94__ Date Shipped to Lab__4__/__1__/__94__

Shipped by ________________________________ Received by ________________________________
(signature) (signature)

HUD and EPA interim guidance on soil levels: 400 µg/g in areas children have access to soil; 2,000 µg/g in areas children are not likely to have access to bare soil.

Part III: Lead Hazard Control Options

14. Lead-Based Paint Policy Statement

    (Not Applicable)

15. Name of Individual in Charge of Lead-Based Paint Hazard Control Program: Joseph Smith

16. Recommended Changes to Work Order System and Property Management

The work order system is an informal verbal one. If painted surfaces will be disturbed during a particular repair job, the painted surface should be tested to determine if it has lead-based paint on it. If it does (or if testing is not completed), the maintenance worker should take the necessary precautions by wetting down the surface and performing cleanup. If the surface area is large, clearance testing should be completed before residents move back into the room.

Paint chips are now cleaned up by sweeping. Mopping or other wet cleaning methods should be used instead.

If residents are present, the work area should be sealed off so that leaded dust does not enter the living area. Any furniture present should be moved or covered with plastic. Further details are provided in the Appendix. The possible presence of lead-based paint should be considered in all repair and maintenance work.

A lead-based paint inspection should be completed at some point in the future to determine exactly where all the lead-based paint is located so that it can be properly managed.

The Anywhere, Any State Childhood Lead Poisoning Prevention Program offers a general awareness class in lead-based paint hazards, which both the owner and the maintenance worker should attend. The program also offers the use of a HEPA vacuum and provides advice on respirators and medical surveillance and other lead-related issues (see Appendix).

The practice of examining the condition of the paint annually or upon vacancy is a good one and should be continued.

Since the paint has not yet been completely tested, it should be assumed to contain lead-based paint. The owner should tell residents to report any paint that is peeling, chipping, flaking, chalking, or otherwise deteriorating so that it can be repaired quickly and safely.

17. Interim Control Options and Estimated Costs

The costs shown below include labor, materials, worker protection, site containment and cleanup. These are only very rough estimates that may not be accurate; a precise estimate should be obtained from a certified lead-based paint abatement contractor. I would be pleased to perform clearance testing after this work has been completed at your request.

Hazard No. 1: Window Trough Surfaces

a. Paint Film Stabilization of both frame and sash — $xx/window
b. Encapsulation of Exterior Frame with a Liquid Encapsulant Coating plus sash replacement — $xx/window

Hazard No. 2: Leaded Dust On Bobby Jones' Bedroom (Southeast Bedroom) Floor

a. Dust removal and recoating hardwood floor with polyurethane — $xxx

Hazard No. 3: Deteriorated Lead-Based Paint on the interior door leading to Bobby's Bedroom (Southeast Bedroom)

a. Paint Film Stabilization plus rehang door for smooth operation (paint film stabilization alone without door repair is not appropriate) — $xx

18. Abatement Options and Estimated Costs

Hazard No. 1 Window Trough Surfaces

a. Enclosure of window frame with metal panning system plus sash replacement — $xx/window
b. Replacement of entire window assembly — $xx/window
c. Remove all lead-based paint from entire window assembly using chemical paint removers — $xx/window

Leaded Dust On Bobby's Bedroom (Southeast Bedroom) Floor

a. Enclosure of floor with new subflooring and tile — $xxx/room

Deteriorated Lead-Based Paint on the interior door leading to Bobby's Bedroom (Southeast Bedroom)

a. Replace door and door frame — $xxx
b. Encapsulate door — $xxx
c. Replace door and enclose door frame — $xxx
d. Remove lead-based paint from door and door frame chemically — $xxx

19. Reevaluation and Monitoring Schedule

Each of these treatments will need to be reexamined periodically to make certain that they remain effective and to ensure that new lead-based paint hazards do not appear. The interim controls shown above are less expensive initially, but they may be more expensive in the long run since they need to be reevaluated more frequently. The replacement and paint removal methods are more expensive initially, but do not require any reevaluation.

The owner should monitor the condition of the paint annually. A professional reevaluation is also needed. The standard schedule for reevaluating the dwelling is shown below.

Unadjusted Standard Reevaluation Schedules Recommended By HUD

Hazard Control Method	Standard Reevaluation Schedule[1]	Type of Reevaluation
Dust Removal	1 year, 2 years later Annually	Dust Sampling Visual Examination of Suspect Paint
Paint Film Stabilization	1 year, 2 years later Annually	Dust Sampling Visual Examination of Suspect Paint
Encapsulation	1 month, 6 months; annually thereafter	Visual Examination of Encapsulant Integrity
Enclosure	Annually	Visual Examination
Removal of All Lead-Based Paint	None	None
Building Component Replacement	None	None

[1]Taken from Table 6.1 of the HUD *Guidelines.*

Part IV: Site-Specific Lead Hazard Control Plan

20. Lead Hazard Control Option To Be Implemented in This Property

Hazard No. 1: Window Trough Surfaces

Paint Film Stabilization of both frame and sash

Hazard No. 2: Leaded Dust On Bobby Smith's Bedroom (Southeast Bedroom) Floor

Dust removal and recoating hardwood floor with polyurethane

Hazard No. 3: Deteriorated Lead-Based Paint on the interior door leading to Bobby's Bedroom (Southeast Bedroom)

Replace door and door frame

Reevaluation: The normal reevaluation schedule for this interim control measure is 12 months. Because this building is in good condition and existing dust levels were not more than 10 times the HUD Interim Standards (and also because the owner is making a sincere attempt to control lead hazards), the dwelling qualifies for an 18 month site-specific reevaluation schedule. The dwelling should be reevaluated in September 1995 (18 months from now).

21. Training Plan for Managers, Maintenance Supervisors and Workers

The part-time worker will attend the lead awareness class offered by the Anywhere Any State Childhood Lead Poisoning Prevention Program to learn how maintenance work can be conducted safely when dealing with lead-based paint. The owner has agreed to attend the same class. The Appendix to this report contains brochures with the relevant information.

22. Method of Resident Notification of Results of Risk Assessment and Lead Hazard Control Program

The results of this report will be described by the owner to the residents in the dwelling. The brochure in the Appendix will be provided to the residents. The owner will explain to the resident that the lead hazards at the property will be corrected within two weeks. The dwelling will be tested after the work has been completed to make certain that it was effective. After the work has been completed and clearance established, a certificate will be appended to this report.

23. Signatures (Risk Assessor and Owner), Date and Certificate of Lead-Based Paint Compliance

______________________________ _______________
Joseph Smith, Owner (date)

______________________________ _______________
Michael Hazard, Certified Risk Assessor (date)

Certificate of Lead-Based Paint Compliance

I hereby certify that on May 1, 1994 the dwelling located at 1234 Main St, Anywhere, Any State meets the criteria established by the Department of Housing and Urban Development for lead safety. Either no lead-based paint hazards were identified or all lead-based paint hazards have been corrected.

____

Owner Date

____

Authorized Signature Date

Expiration Date: September 1, 1995

Any State
Department of Health
Division of Childhood Lead Poisoning Prevention

APPENDIX B

EXAMPLE OF A RISK ASSESSMENT REPORT FOR A LARGE MULTI-FAMILY HOUSING DEVELOPMENT

Example of a Risk Assessment Report for a Large Multi-Family Housing Development

Part I: Identifying Information:

Lead-Based Paint Risk Assessment Report

For Home Sweet Home Apartment Building

5678 Main St.
Anywhere, Any State 30000

Prepared For:

Mr. Joseph H. Smith, Owner
4444 Podunck Way
Anywhere, Any State 30000
400-777-7777

By:

Michael L. Hazard, Certified Risk Assessor
5678 Snowflake St.
Anywhere, Any State 300000
400-333-3333

Any State License No. 94-567
EPA Certificate No. 33456

April 19, 1994

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Summary

A lead-based paint risk assessment was conducted at the Home Sweet Home Apartment Building at 5678 Main St. in Anywhere, Any State 30000 for Mr. Joseph H. Smith, Owner, who is located at 4444 Podunck Way, Anywhere, Any State 30000 (400-777-7777) on April 1, 1994. The risk assessment was conducted by Michael L. Hazard, a Certified Risk Assessor (Any State License No. 94-567).

Home Sweet Home contains 438 apartments distributed through 15 stories. All the apartments are of a similar construction and have been repainted over the years in a similar fashion (the apartment owner's maintenance crew does most of the painting). Twenty-three of the units were targeted for sampling and visual assessment for this risk assessment using the criteria established in the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing. One of these 23 targeted dwellings had been recently prepared for reoccupancy.

The building and its paint are in relatively poor condition overall, with water leaks and structural deficiencies evident throughout. The risk assessment showed that lead-based paint hazards exist in the following locations:

1. Deteriorated lead-based paint on the exterior doors, window troughs, exterior trim and on the interior kitchen and bathroom walls.

2. Leaded dust on window troughs and in common hallways.

3. Contaminated soil in the play area located at the front of the building and around the building perimeter.

Paint chip sampling indicated that lead-based paint is present on exterior doors, window troughs, exterior trim, and on interior kitchen and bathroom walls. Previous lead-based paint testing at this location indicated that lead-based paint was present on <u>all</u> interior walls and kitchen cabinets, but in no other location. A review of the testing report showed that many painted surfaces had not been tested at all. For those that were tested, no attempt had been made to correct for the substrate underneath the paint. For example, the previous report indicated that lead-based paint was present on the kitchen cabinets. However, laboratory analysis of this paint indicated that the cabinets do <u>not</u> in fact contain lead-based paint and therefore do not require treatment. A more complete lead-based paint testing effort is needed if the exact locations of lead-based paint is to be determined. The previous testing report should not be relied upon to determine how maintenance and other repair work should be done.

Dust testing showed that leaded dust on window troughs averaged 10,532 $\mu g/ft^2$, more than 10 times greater than the HUD standard of 800 $\mu g/ft^2$.

Soil lead levels around the perimeter of the building and in the playground in front of the building were between 3,000 - 4,000 $\mu g/g$, well above the HUD and EPA interim levels of 400 $\mu g/g$ for high contact areas and 2,000 $\mu g/g$ for areas children are not likely to contact.
After considering a number of options, the owner has decided to use interim controls in the immediate future, since the building is scheduled for comprehensive renovation within several years. These interim controls include:

- Stabilizing the paint on all surfaces that have deteriorated lead-based paint
- Removal of leaded dust located on window troughs and in common hallways
- Covering the bare soil with new sod and planting thorny bushes around the building perimeter to prevent children from entering this area. The play area will be covered with a suitable ground liner and then covered with sand at least 12 inches deep.

Mr. Smith has chosen to use interim controls until the building is renovated, which is scheduled to occur in 1998. A lead-based paint inspection will be performed at that time with the intent of including abatement in the renovation plans. The ten maintenance workers (some of whom work in other nearby apartment buildings owned by Mr. Smith), will all be trained in lead-based paint work practices. Certain property management practices will also be adopted to ensure that the normal repair work done will not disturb those surfaces with lead-based paint.

After the interim control work has been completed, a clearance examination, including dust sampling must be completed to make certain that the dwelling is lead-safe before the family moves back into the affected rooms.

Reevaluation: The normal reevaluation schedule for this interim control measure is 12 months. Because existing dust levels are more than 10 times the HUD Interim Lead Dust Standards, the building must be reevaluated 6 months from now. Therefore, the building should be reevaluated in September 1994 (six months from now).

If the conditions improve, future reevaluation periods can be lengthened using the criteria specified in the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.

After explaining the control measures that will be undertaken, Mr. Smith has agreed to share the results of this report with the residents in the building, and to provide each family with the EPA brochure and a brochure from the Anywhere Childhood Lead Poisoning Prevention program as a way of educating the residents.

Form 5.6
Management Data For Rental Dwellings

Part 1: Identifying Information

Identifying Information:

Name of Building or Development Home Sweet Home Apartment Building
Number of Buildings ____1_____
Number of Individual Dwelling Units/Building: ____438___
Number of Total Dwelling Units: ___438____
Date of Construction 1937
Date of Substantial Rehab, if any None

List of Addresses of Dwellings (attach list if more than 10 dwellings are present)

Apt No.	Address	No. Children Aged 0 - 6 Years Old	Recent Code Violation Reported by Owner?	Chronic Maintenance Problem?
1	5678 Main St. Anywhere, Any State	209	No	No
2		2	No	No
3		1	No	No
4		3	No	No
5		0	No	No
6		0	No	No
7		0	No	No
8		2	No	No
9		3	Yes	Yes
10		0	No	

(Other pages of this form would be included to list all 438 units)
Record number and locations of common child play areas (on-site playground, backyards, etc.)

Number 1 On-Site Playground in Front of Building

Part 2: Management Information

1. List names of individuals who have responsibility for lead-based paint. Include owner, property manager (if applicable), maintenance supervisor and staff (if applicable) and others. Include any training in lead hazard control work (inspector, supervisor, worker, etc.) that has been completed. Use additional pages, if necessary.

   This information will be needed to devise the risk management plan contained in the risk assessor's report.

Name	Position	Training Completed (if none, enter "None")
Joseph Smith	Owner	None
Madeline Fairfield	Property Manager	None
Joe Sweat	Maintenance Supervisor	None

2. Is there a lead hazard control policy statement?
   _______ Yes __X____ No (If yes, attach statement)

3. Has there been previous lead-based paint evaluations?
   __X__ Yes _______ No (If yes, attach the report)

4. Has there been previous lead hazard control activity?
   _______ Yes ___X___ No (If yes, attach the report)

5. Describe dwelling turnover procedure, including typical cleaning, repainting, and repair activity.

The dwelling has all trash removed after the resident has left. Joe Sweat inspects the dwelling and decides whether repainting is needed or other repairs to building systems are necessary. After performing any repainting or other repairs, the floors are mopped and the kitchen counters and bathrooms cleaned. All other floors are vacuumed.

6. Employee and Worker Safety Plan

   a. Is there an occupational safety and health plan for maintenance workers?
      ______ Yes ___X___ No (If yes, attach plan)

   b. Are workers trained in lead hazard recognition?
      ______ Yes ___X___ No If yes, who performed the training?
      ____

c. Are workers involved in a hazard communication program?
_______ Yes ___X___ No

d. Are workers trained in proper use of respirators?
_______ Yes ___X___ No

e. Is there a medical surveillance program
_______ Yes ___X___ No

7. Is there a HEPA Vacuum available?
_______ Yes ___X___ No

8. Are there any on-site licensed or unlicensed day-care facilities.
_______ Yes ___X___ No If yes, give location ____________________________

9. Planning for Resident Children with Elevated Blood Levels

a. Who responds for the owner if a resident children with elevated blood lead levels is identified?
Madeline Fairfield

b. Is there a plan to relocate such children?
_______ Yes ___X___ No If Yes, Where? ____________________________________

c. Do you (the owner) know if there ever has been a resident child with an elevated blood lead level?
_______ Yes _______ No ___X___ Unknown

10. Owner Inspections

a. Are there periodic inspections of all dwellings by the owner?
___X___ Yes _______ No If Yes, how often? Every year or whenever the unit is vacant

b. Is the paint condition assessed during these inspections?
___X___ Yes _______ No

11. Do you (the owner) know if any of the dwellings have ever received a housing code violation notice?
_______ Yes ___X___ No _______ Unknown If yes, describe code violation
____
____

12. If previously detected, unabated lead-based paint exists in the dwelling, have the residents been informed? _______ Yes ___X___ No

Form 5.7
Maintenance Data for Rental Dwellings

Condition of Paint on Selected Surfaces (<u>Separate Page For Each Targeted Dwelling</u>)

Building Component	Location Notes	Paint Condition (Good, Fair, Poor, or Not Present) To Be Completed by Risk Assessor	Deterioration Due to Friction or Impact?	Deterioration Due to Moisture?	Location of Painted Component with Visible Bite Marks
Building Siding		Fair			
Exterior Trim	South side	Poor	No	No	
Window Troughs		Poor	No	No	
Exterior Doors		Poor	Yes	No	
Railings	Porch	Fair	Yes	No	
Porch Floors		Not Applicable			
Other Porch Surfaces		Not Applicable			
Interior Doors		Fair	Yes	No	
Ceilings	Bathroom	Fair		No	
Walls		Good (Kitchen and Bathroom Walls are Poor)			
Interior Windows		Fair	Yes	No	
Interior Floors		Fair	Yes	No	
Interior Trim		Good			
Stairways		Fair	Yes	No	
Radiator (Or Radiator Cover)		Good			
Kitchen cabinets		Poor	No	No	
Bathroom cabinets		Good			
Other surfaces					

If the overall condition of a component is similar throughout a dwelling, that condition should be recorded. If a component in a couple of locations is in poor condition, but the overall condition is good or fair, the specific sites of the badly deteriorated paint should be noted. The specific locations of any component with bite marks should be recorded.

Form 5.7 (continued)

1. Painting Frequency and Methods

   a. How often is painting completed? every ____5_____ years

   b. Is painting completed upon vacancy, if necessary?
   __X____ Yes ______ No

   c. Who does the painting? ___X____Property Owner _______Residents
   IF Residents, SKIP to Q.2

   d. Is painting accompanied by scraping, sanding, or paint removal?
   ___X___ Yes ______ No

   e. How are paint dust/chips cleaned up? (check one)
   __X____ Sweeping ______ Vacuum ______ Mopping ______ HEPA/TSP/HEPA

   f. Is the work area sealed off during painting?
   ______ Yes __X____ No

   g. Is furniture removed from the work area?
   ______ Yes ___X___ No

   h. If no, is furniture covered during work with plastic?
   ______ Yes ___X___ No

2. Is there a preventive maintenance program?
   ______ Yes ___X___ No

3. Describe work order system (if applicable, attach copy of work order form)

   Ms. Madeline Fairfield, property manager, receives complaints from residents and prepares a written work order for Mr. Joe Sweat, maintenance supervisor, who assigns the job to one or more individual workers

4. How are resident complaints received and addressed? How are requests prioritized? If formal work orders are issued, is the presence or potential presence of lead-based paint considered in the work instructions?

   Resident complaints are received directly by the property manager, who then authorizes the maintenance supervisor to complete the necessary repairs. The presence of lead-based paint is not routinely considered in the repair and maintenance work.

5. Record location of dwellings recently prepared for reoccupancy.

   Apartment 234

Form 5.1
Building Condition Form

Condition	Yes	No
Roof missing parts of surfaces (tiles, boards, shakes, etc.)		X
Roof has holes or large cracks	X	X
Gutter or downspouts broken or missing	X	
Chimney masonry cracked, bricks loose or missing, obviously out of plumb		X
Exterior or interior walls have obvious large cracks or holes, requiring more than routine painting (if masonry) or painting		X
Exterior siding has missing boards or shingles	X	X
Water stains on interior walls or ceilings	X	X
Plaster walls or ceilings deteriorated		X
Two or more windows or doors broken, missing, or boarded up	X	X
Porch or steps have major elements broken, missing, or boarded up		X
Foundation has major cracks, missing material, structural leans, or visibly unsound		X
Total Number*	5	

*If the "Yes" column has 2 or more checks, the dwelling is considered to be in poor condition. Less than 2 checks in the "Yes" column means that the dwelling appears to be well maintained and the Standard Reevaluation Schedule does not need to be revised. Only buildings in "good" condition are eligible for the Lead Hazard Screen.

Notes:

Form 5.3
Field Sampling Form for Deteriorated Paint
(Use a Separate Page for Every Unit in Multi-Family Housing)

Name of Risk Assessor Michael Hazard
Name of Property Owner Joseph Smith
Property Address 5678 Main St. Anywhere Any State 30000 Apt. No. 9

Sampling Protocol ____All Dwellings __X__Targeted ____Worst-Case ____Random
Target Dwelling Criteria (Check All That Apply)

__X__ Code Violations
__X__ Judged to be in Poor Condition
__X__ Presence of 2 or More Children between Ages of 6 Months and 6 Years
_____ Serves as Day-Care Facility
_____ Recently Prepared for Reoccupancy

Sample Number	Room	Building Component	Laboratory Result (μg/g) or XRF Reading (mg/cm^2)
1	Southeast Child's Bedroom (Bobby's Room)	Window Trough Frame	12,638 μg/g
2	Kitchen	Cabinets	238 μg/g
3	Kitchen	Walls	7,893 μg/g
4	Bathroom	Walls	10,487 μg/g
HUD Standard			5,000 μg/g or 1 mg/cm^2

Sample all layers of paint, not just deteriorated paint layers
Total Number of Samples This Page 4
Page 1 of 1
Date of Sample Collection 4 / 1 / 94 Date Shipped to Lab 4 / 1 / 94
Shipped by ____________ Received by ____________
(signature) (signature)
Date Results Reported 4 / 10 / 94 Analyzed by Lisa Baker
Approved by Jim Zimmerman

Form 5.4a
Field Sampling Form for Dust
(Composite Sampling)

Name of Risk Assessor ___Michael Hazard________________________
Name of Property Owner ___Joseph Smith________________________
Property Address _5678 Main St_____________ Apt. No.____9_______

Dwelling Selection Protocol _____ All Dwellings __X___ Targeted _____ Worst-Case _____ Random

Target Dwelling Criteria (Check All That Apply)
__X__ Code Violations
__X__ Judged to be in Poor Condition
__X__ Presence of 2 or More Children between Ages of 6 Months and 6 Years
_____ Serves as Day-Care Facility
_____ Recently Prepared for Reoccupancy

Sample Number	Record Name of Rooms Used by Owner or Resident to be Included in Sample	Dimension[1] of Surface Sampled in Each Room (inches x inches)	Total Surface Area Sampled (ft²)	Type of Surface Sampled	Is Surface Smooth and Cleanable?	Lab Result (µg/ft²)
1	Kitchen Living Room Child's Bedroom 2nd Bedroom	12 x 12 12 x 12 12 x 12 12 x 12	4	Smooth Floors	Yes	124
	________ ________ ________ ________	____ x ____ ____ x ____ ____ x ____ ____ x ____		Carpeted Floors		
2	Kitchen Living Room Child's Bedroom 2nd Bedroom	3 x 33.5 3.25 x 33.5 3.25 x 33.5 3.25 x 33.5	2.97	Interior Window Sills	Yes	336
3	Kitchen Living Room Child's Bedroom 2nd Bedroom	2.4 x 33.5 2.5 x 33.5 2.5 x 33.5 2.5 x 33.5	2.30	Exterior Window Sills	No	16,456

[1] Measure to the nearest 1/8 inch

Total Number of Samples This Page___3_____
Page ____1_____ of ___27______
Date of Sample Collection__4__/__1__/__94__ Date Shipped to Lab_4___/_1___/_94___
Shipped by ______________________________ Received by ______________________________
(signature) (signature)

HUD Standards: 100 µg/ft² (floors), 500 µg/ft² (interior window sills), 800 µg/ft² (window troughs)

Form 5.4a
Field Sampling Form for Dust
(Composite Sampling)

Name of Risk Assessor ___Michael Hazard______________________
Name of Property Owner ___Joseph Smith______________________
Property Address _5678 Main St_____________ Apt. No._COMMON AREAS__

Dwelling Selection Protocol _____All Dwellings __X___ Targeted _____Worst-Case _____ Random
Target Dwelling Criteria (Check All That Apply)
______ Code Violations
______ Judged to be in Poor Condition
______ Presence of 2 or More Children between Ages of 6 Months and 6 Years
______ Serves as Day-Care Facility
______ Recently Prepared for Reoccupancy

Sample Number	Record Name of Rooms Used by Owner or Resident to be Included in Sample	Dimension[1] of Surface Sampled in Each Room (inches x inches)	Total Surface Area Sampled (ft^2)	Type of Surface Sampled	Is Surface Smooth and Cleanable?	Lab Result ($\mu g/ft^2$)
C-1	1st Floor Hallway 5th Floor Hallway 9th Floor Hallway 13th Floor Hallway	12 x 12 12 x 12 12 x 12 12 x 12	4	Smooth Floors	Yes	124
C-2	1st Floor Hallway 5th Floor Hallway 9th Floor Hallway 13th Floor Hallway	3 x 33.5 3.25 x 33.5 3.25 x 33.5 3.25 x 33.5	2.97	Window Troughs	No	47,894
C-3	1st Floor 5th Floor 9th Floor 13th Floor	8 x 12 8x12 8x12 8x12	2.67	Stair Treads	No	336
C-4	1st Floor 5th Floor 9th Floor 13th Floor	12 x 12 12 x 12 12 x 12 12 x 12	4	Landings	No	16,456

[1] Measure to the nearest 1/8 inch

Total Number of Samples This Page___4_____
Page ____2_____ of ___27______
Date of Sample Collection__4__/__1__/__94__ Date Shipped to Lab_4___/_1___/_94___
Shipped by ______________________________ Received by ______________________________
(signature) (signature)

HUD Standards: 100 $\mu g/ft^2$ (floors), 500 $\mu g/ft^2$ (interior window sills), 800 $\mu g/ft^2$ (window troughs)

Form 5.5
Field Sampling Form For Soil
(Composite Sampling Only)

Name of Risk Assessor ____Michael Hazard____________________
Name of Property Owner ___Joseph Smith____________________
Property Address _4567 Main St. Anywhere, Any State____________________

Sample No.	Location	Bare or Covered	Lab Result (μg/g)
S-1	Building Perimeter (North & East Sides)	Bare	3,989
S-2	Building Perimeter (South & West Sides)	Bare	3,498
S-3	Play Area Front Playground	Bare	3,897
	Play Area 2 (describe) ____________		

Collect only the top ½" of soil

Total Number of Samples This Page____3____
Page ___3______ of ____27_____
Date of Sample Collection__4__/__1__/__94__ Date Shipped to Lab__4__/__1__/__94__

Shipped by ______________________________ Received by ______________________________
(signature) (signature)

HUD and EPA interim guidance on soil levels: 400 μg/g in areas children have access to soil; 2,000 μg/g in areas children are not likely to have access to bare soil.

Part III: Lead Hazard Control Options

14. Lead-Based Paint Policy Statement

Home Sweet Home has decided to adopt a lead-based paint policy statement, as follows:

Home Sweet Home Property Management Company is committed to controlling lead-based paint hazards in all its apartments. Madeline Fairfield, Property Manager, has my authority to direct all activities associated with lead hazard control, including directing training, issuing special work orders, informing residents, responding to cases of children with elevated blood lead levels, correcting lead-based paint hazards on an emergency repair basis, and any other efforts that may be appropriate. The company's plan to control such hazards is detailed in a risk assessment report and lead hazard control plan.

(Signed)_Joseph Smith________________________ __________(Date)

(Owner)

(Signed)__Madeline Fairfield________________________ __________(Date)

(Lead Hazard Control Program Manager)

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15. Name of Individual in Charge of Lead-Based Paint Hazard Control Program Madeline Fairfield

16. Recommended Changes to Work Order System and Property Management

If painted surfaces will be disturbed during a particular repair job, the painted surface should be tested to determine if it has lead-based paint on it, unless it has been tested previously by reliable testing. The results in this report indicate that lead-based paint is definitely present on exterior doors, window trough frames, exterior trim, and kitchen and bathroom walls. All other surfaces should be considered to be suspected lead-based paint until they have been tested. If lead-based paint is present (or is suspected to be present), the maintenance worker should take the necessary precautions by wetting down the surface and performing cleanup. If the surface area is large, clearance testing should be completed before residents move back in. The work order should indicate whether respirators and protective clothing are needed, how extensive the cleaning should be, and any other special precautions. The Appendix to this report contains a sample of a work order form for lead-based paint work.

Paint chips are now cleaned up by sweeping. Mopping or other wet cleaning methods should be used instead.

If residents are present, the work area should be sealed off so that leaded dust does not enter the living area. Any furniture present should be moved or covered with plastic. Further details are provided in the Appendix. The possible presence of lead-based paint should be considered in all repair and maintenance work.

A lead-based paint inspection should be completed at some point in the future to determine exactly where all the lead-based paint is located so that it can be properly managed.

The Appendix to this report contains a list of training providers who can train the maintenance workers to handle lead-based painted surfaces safely.

A HEPA vacuum should be purchased for routine use.

The Appendix also contains information on medical surveillance, respirator use, and other important considerations.

The practice of examining the condition of the paint annually or upon vacancy is a good one and should be continued.

Since the paint has not yet been fully and adequately tested, it should be assumed to contain lead-based paint. The owner should tell residents to report any paint that is peeling, chipping, flaking, chalking, or otherwise deteriorating so that it can be repaired quickly and safely.

17. Interim Control Options and Estimated Costs

The costs shown below include labor, materials, worker protection, site containment and cleanup. These are only very rough estimates that may not be accurate; a precise estimate and a full lead hazard control plan should be obtained from a certified lead-based paint abatement contractor. I would be pleased to help you develop such a plan if you request.

Hazard No. 1: Deteriorated Lead-Based Paint on Exterior Doors, Exterior Side of Windows, Exterior Trim, Kitchen Walls and Bathroom Walls

a. Repair of Water Leaks, followed by Paint Film Stabilization $xx

b. Repair of Water Leaks, followed by Encapsulation of Exterior Door and Window Frames with a Liquid Encapsulant Coating plus sash replacement $xx

Hazard No. 2: Leaded Dust On Window Troughs and Common Hallways

a. Dust removal followed by sealing concrete stairway floors with concrete sealant and paint film paint film stabilization of window troughs.

Hazard No. 3: Contaminated Soil in the Playground and Around the Building Perimeter

a. Fence off playground and building perimeter to eliminate access $xx

b. Cover soil with a suitable material such as bark, gravel, sand, astroturf and plant dense thorny bushes around building perimeter to limit access

18. Abatement Options and Estimated Costs

Hazard No. 1: Deteriorated Lead-Based Paint on Exterior Doors, Exterior Side of Windows, Exterior Trim, Kitchen Walls and Bathroom Walls (all options assume repair of water leaks occurs first)

a. Replace doors $xx
b. Chemically remove paint from doors and repaint $xx
c. Replace windows and exterior trim $xx
d. Chemically remove paint from windows and trim and repaint $xx
e. Remove paint from trim using heat guns operating below 1100°F $xx
f. Enclosure of kitchen and bathroom walls $xx
g. Demolish and replace kitchen and bathroom walls $xx

Hazard No. 2: Leaded Dust On Window Troughs and Common Hallways

a. Cover exterior sills with aluminum coil stock $xx
b. Replace exterior sills $xx
c. Install new tiles in common hallways $xx

Hazard No. 3: Contaminated Soil in the Playground and Around the Building Perimeter

a. Remove and replace top soil around building and in playground $xx
b. Pave soil around building perimeter with asphalt or cement plus eliminate playground $xx
c. Pave soil around building perimeter and cover play area with a geotextile fabric and cover with new sand, soil, bark or other material providing adequate fall protection. Do not pave playground area. $xx

19. Reevaluation Schedule

The owner should examine the condition of all treatments every two months.

Each of these treatments will need to be reexamined by a certified risk assessor at specific time intervals to make certain that they remain effective and to ensure that new lead-based paint hazards do not appear. The interim controls shown above are less expensive initially, but they may be more expensive in the long run since they need to be reevaluated more frequently. The replacement and paint removal methods are more expensive initially, but do not require any reevaluation. The standard schedule for reevaluating the dwelling is shown below.

Hazard Control Method	Standard Reevaluation Schedule[1]	Type of Reevaluation
Dust Removal	1 year, 2 years later Annually	Dust Sampling Visual Examination of Suspect Paint
Paint Film Stabilization	1 year, 2 years later Annually	Dust Sampling Visual Examination of Suspect Paint
Soil Interim Control	3 months, then annually	Visual Examination
Soil Abatement	Annually	Visual Examination for new bare spots or deterioration of paving
Enclosure	Annually	Visual Examination
Removal of All Lead-Based Paint	None	None
Building Component Replacement	None	None

[1]Taken from Table 6.1 of the HUD *Guidelines.*

Part IV: Site-Specific Lead Hazard Control Plan

20. Lead Hazard Control Option To Be Implemented in This Property

Hazard No. 1: Deteriorated Lead-Based Paint on Exterior Doors, Exterior Side of Windows, Exterior Trim, Kitchen Walls and Bathroom Walls

Repair of Water Leaks, followed by Paint Film Stabilization $xx

Hazard No. 2: Leaded Dust On Window Troughs and Common Hallways

Dust removal followed by sealing concrete stairway floors with concrete sealant and paint film paint film stabilization of window troughs.

Hazard No. 3: Contaminated Soil in the Playground and Around the Building Perimeter

Soil in the playground will be covered by a liner and sand at least 12 inches deep. Dense thorny bushes will be planted around building perimeter to limit access.

Reevaluation: The normal reevaluation schedule for this interim control measure is 12 months. Because this building is in poor condition and existing dust levels are more than 10 times the HUD Interim Lead Dust Standards, the building meets the criteria for a reduction in the reevaluation schedule to 6 months. Therefore, the building should be reevaluated in September 1994 (six months from now).

If the conditions improve, future reevaluation periods can be lengthened using the criteria specified in the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.

21. Training Plan for Managers, Maintenance Supervisors and Workers

Ms. Madeline Fairfield will attend the lead hazard awareness training course offered by the Anywhere Childhood Lead Poisoning Prevention Program. She will be responsible for ensuring that all maintenance workers and their supervisors are trained in lead-based paint work practices.

22. Method of Resident Notification of Results of Risk Assessment and Lead Hazard Control Program

The results of this report will be described by the owner to the residents in the dwelling through a brief summary that will be placed in each resident's mailbox. The brochure in the Appendix will be provided to the residents. The owner will explain to the residents that the lead hazards at the property will be corrected within two weeks and that all residents should report any deteriorating paint in the future to Ms. Fairfield. The dwelling will be tested after the work has been completed to make certain that it was effective.

23. Signatures (Risk Assessor and Owner), Date and Certificate of Lead-Based Paint Compliance

After the work has been completed and clearance established, a certificate will be appended to this report.

______________________________ ____________
Joseph Smith, Owner (date)

______________________________ ____________
Michael Hazard, Certified Risk Assessor (date)

Certificate of Lead-Based Paint Compliance

I hereby certify that on May 1, 1994 the apartment building located at 5678 Main St, Anywhere, Any State meets the criteria established by the Department of Housing and Urban Development for lead safety. Either no lead-based paint hazards were identified or all lead-based paint hazards have been corrected.

____

Owner

____

Authorized Signature

Expiration Date: September 1, 1994

Any State
Department of Health
Division of Childhood Lead Poisoning Prevention