

SECTION 12

EXCERPT

**HUD Guidelines for the Evaluation and Control of
Lead-Based Paint Hazards in Housing, Second
Edition, July 2012**

**Table of Contents
Chapter 1: Introduction
Glossary of Terms**

Table Of Contents: Guidelines 2nd Edition

ACKNOWLEDGEMENTS iii

PREFACE v

CHAPTERS

Chapter 1	Introduction	1–1
Chapter 2	Where to Go for Help – Qualifications, Roles and Resources	2–1
Chapter 3	Before You Begin – Planning To Control Lead Hazards.....	3–1
Chapter 4	Lead-Based Paint and Housing Renovation	4–1
Chapter 5	Risk Assessment and Reevaluation	5–1
Chapter 6	Ongoing Lead-Safe Maintenance	6–1
Chapter 7	Lead-Based Paint Inspection.....	7–1
Chapter 8	Resident Protection and Worksite Preparation	8–1
Chapter 9	Worker Protection	9–1
Chapter 10	Housing Waste.....	10–1
Chapter 11	Interim Controls	11–1
Chapter 12	Abatement	12–1
Chapter 13	Abatement by Encapsulation.....	13–1
Chapter 14	Cleaning.....	14–1
Chapter 15	Clearance.....	15–1
Chapter 16	Investigation and Treatment of Dwellings that House Children with Elevated Blood Lead Levels	16–1
Chapter 17	(Reserved for future use).....	17–1
Chapter 18	Lead-Based Paint and Historic Preservation.....	18–1

GLOSSARY..... G–1

APPENDICES

Appendix 1	Units of Measure Used in the Lead-Based Paint Field	APP 1–1
Appendix 2	CDC’s Childhood Lead Poisoning Prevention Program	APP 2–1
Appendix 3	U.S. EPA Regional Offices	APP 3–1
Appendix 4	OSHA Regional Offices and State Programs	APP 4–1
Appendix 5	EPA Training, Certification and Accreditation Programs	APP 5–1
Appendix 5.1	Structured On-the-Job Training (OJT) vs. Unstructured OJT	APP 5.1–1
Appendix 6	HUD, EPA, OSHA, CPSC, and NPS Lead Paint Rules	APP 6–1
Appendix 7.1	(Reserved for future use)	APP 7.1–1



Appendix 7.2 Types of Lead-Based Paint Enclosure SystemsAPP 7.2–1

Appendix 7.3 Generic Lead Based Paint SpecificationsAPP 7.3–1

Appendix 7.4 Guidance on Specifications for Interim Control of Soil Lead Hazards..... APP 7.4–1

Appendix 8.1 Example of a Pre-Rehabilitation Risk Assessment and Limited Paint Testing Report for a Single-Family Dwelling Operated By a Small-Scale OwnerAPP 8.1–1

Appendix 8.2 Example of a Risk Assessment Report for Large Multi-family Housing Development APP 8.2–1

Appendix 9 Lead-Based Paint Liability Insurance APP 9–1

Appendix 10 (Reserved for future use) APP 10–1

Appendix 10.1 State and Territorial Hazardous Waste Management Agencies APP 10.1–1

Appendix 11 One -Hour Waiting Period Rationale for Clearance Sampling APP 11–1

Appendix 12 Statistical Rationale for Sample Sizes and Percentages Used in Guidance for Inspecting in Multi-Family Housing..... APP 12–1

Appendix 13.1 Wipe Sampling of Settled Dust for Lead DeterminationAPP 13.1–1

Appendix 13.2 Paint Chip Sampling..... APP 13.2–1

Appendix 13.3 Collecting Soil Samples for Lead DeterminationAPP 13.3–1

Appendix 13.4 (Reserved for future use).....APP 13.4–1

Appendix 13.5 EPA Information on Drinking Water.....APP 13.5–1

Appendix 14.1 EPA-Recognized Laboratories for Analysis of Lead in Paint, Dust and Soil.....APP 14.1–1

Appendix 14.2 (Reserved for future use).....APP 14.2–1

Appendix 14.3 Procedure for the Preparation of Field Spiked Wipe SamplesAPP 14.3–1

Appendix 15 OSHA Lead in Construction Guidance..... APP 15–1

Appendix 16 CDC Guidance on Lead Poisoning Prevention..... APP 16–1

FIGURES

Figure 1.1 Some paints contained 50% lead and were aggressively marketed..... 1–6

Figure 1.2 Deteriorated residential paint on house trim 1–7

Figure 1.3 Paint deterioration 1–7

Figure 1.4 Title X’s Lead Hazard Control Framework 1–11

Figure 2.1 Many local health departments distribute information or conduct outreach activities at health fairs or community meetings..... 2–10

Figure 2.2 Risk assessors and property owners planning housing rehabilitation may find an on-site meeting facilitates communication about lead-based paint hazards on a property 2–14

Figure 3.1 Assessing the physical condition of a property 3–8



Figure 3.2	HUD’s American Healthy Homes Survey found that, in 2005–2006, most pre-1940 units contained some lead-based paint	3–9
Figure 3.3	Worker caulking painted surfaces as part of ongoing lead-safe maintenance	3–11
Figure 3.4	Units with children have a higher priority for evaluation and control than other units	3–12
Figure 3.5	Determination of Lead Hazard Control Strategy: Decision-making Logic.....	3–15
Figure 4.1	Sanding wooden floors can generate significant amounts of dust.....	4–4
Figure 4.2	Torching and burning old paint is a prohibited work practice that can generate lead fumes.....	4–6
Figure 4.3	This worksite was not properly prepared for lead-disturbing work by removing the occupant’s belongings.....	4–10
Figure 4.4	HEPA vacuuming is an important step in the specialized cleaning process	4–10
Figure 5.1	Lead Hazard Screen Decision Logic.....	5–12
Figure 5.2	Risk Assessor interviewing a resident.....	5–20
Figure 5.3	Record of sampling locations and floor plan sketch.....	5–21
Figure 5.4	Forms of Paint Deterioration.....	5–25
Figure 5.4a	Peeling paint	5–25
Figure 5.4b	Alligatoring paint	5–25
Figure 5.4c	Blistering paint	5–25
Figure 5.5	Baseboard showing deteriorated paint less than the de minimis amounts.....	5–28
Figure 5.6a	Friction hazard on stairs pre-treatment.....	5–30
Figure 5.6b	Friction hazard on stairs post-treatment.....	5–30
Figure 5.7	Impact surface on door and frame.....	5–31
Figure 5.8	Chewable surface showing teeth marks on window sill.....	5–32
Figure 5.9	Soil lead hazard at dripline.....	5–32
Figure 5.10	Soil lead hazard at dripline of garage.....	5–34
Figure 5.11a	Dust sampling equipment.....	5–37
Figure 5.11b	Pulling a wipe from container	5–37
Figure 5.11c	Making first (horizontal) pass of clearance wipe.....	5–37
Figure 5.11d	Folding wipe.....	5–37
Figure 5.11e	The second (vertical) pass.....	5–37
Figure 5.11f	Placing the used wipe into hard container.....	5–37
Figure 5.12	Floor sampling in high traffic area near entry.....	5–39
Figure 5.13	Window sill and trough.....	5–40



Figure 5.14	Illustrations of window trough and interior window sill.....	5–41
Figure 5.15	Example of basic dust sampling plan.	5–43
Figure 5.16	Dust testing window sill for presence of friction hazard.....	5–44
Figure 5.17	Damage to painted surface caused by paint chip sampling.....	5–52
Figure 5.18	Baby’s bed exhibiting deteriorated paint and evidence of teeth marks.	5–53
Figure 5.19a-c	Soil sampling.....	5–55
Figure 5.20	Example of targeted dwelling selection.....	5–74
Figure 5.21	Example of soil hazard determination in non-play areas.	5–78
Figure 5.22	Example of lead hazard control policy	5–83
Figure 6.1	Visual Assessment.....	6–9
Figure 6.2	Opening screen from HUD's first on-line visual assessment training curriculum. Updates may occur	6–11
Figure 6.3	An area of bare soil beneath a window with deteriorated paint.....	6–14
Figure 6.4	Bare soil in Figure 6.3 covered with mulch (the window was sealed during the process of controlling the bare soil).....	6–23
Figure 6.5	Unit turnover is an excellent time to conduct the visual assessment and perform lead safe maintenance activities.	6–27
Figure 6.6	Clean up supplies.	6–32
Figure 7.1	One type of XRF instrument displays its reading of a testing combination	7–12
Figure 7.2	Child’s bed showing teeth marks in painted surface	7–21
Figure 7.3	Multi-family Decision Flowchart.....	7–43
Figure 7.4	Preparation to take paint chip sample	7–46
Figure 7.5	Removing paint chip sample.....	7–46
Figure 7.6	Damage caused by removing paint chip sample.....	7–47
Figure 7.7	Inspectors must operate XRFs at a safe distance from others	7–52
Figure 8.1	Prohibiting resident entry into work area by use of containment barrier	8–5
Figure 8.2	EPA’s “Renovate Right” Pamphlet.....	8–7
Figure 8.3	Structural deficiency	8–8
Figure 8.4	Example of structural deficiency needing repair prior to work.....	8–8
Figure 8.5	One example of a commercial-type HEPA vacuum.	8–9
Figure 8.6	Inadequate worker protection during a large overhead paint stripping project.	8–9
Figure 8.7	Placing coffee station in the work area is an unsafe work practice.	8–9
Figure 8.8	Floor plastic in work area.....	8–15
Figure 8.9	Plastic barrier between living space and work area.	8–16



Figure 8.10	Interior warning sign.	8-17
Figure 8.11	Exterior warning sign for project shown in Figure 8.10.	8-17
Figure 8.12	Items that are too large to move should be sealed completely and taped.	8-19
Figure 8.13	Removal and wrapping contaminated carpet.	8-20
Figure 8.14	Exterior containment of polyethylene sheeting lines the narrow walkway between two houses.	8-25
Figure 8.15	Exterior containment on building and window; ladder kept on plywood.	8-25
Figure 8.16	Example of barrier tape used as an occupant protection measure	8-26
Figure 8.17	Pre-cleaning window with HEPA vacuum.	8-27
Figure 8.18	Sample Informed Consent Form for Residents of Housing for the Elderly.	8-31
Figure 10.1	Separate waste into categories during work.	10-4
Figure 10.2	Radiators and trim are examples of intact architectural components that are low-level lead waste.	10-6
Figure 10.3	Concentrated lead waste.	10-8
Figure 10.4	Paint chips should be double-bagged and seams sealed.	10-8
Figure 10.5	EPA regulates disposal of hazardous waste	10-9
Figure 11.1	Moisture-Related Causes of Paint Failure.	11-24
Figure 11.2	HEPA Vacuum Sanders.	11-30
Figure 11.3	Window before and after friction treatment.	11-35
Figure 11.4	Examples of impact and chewable surfaces.	11-36
Figure 11.5	Prepare the worksite and pre-clean the window	11-37
Figure 11.6	Remove parting bead.	11-37
Figure 11.7	Remove the bottom sash, sash weights and stops.	11-38
Figure 11.8	Remove sash controls/weights.	11-38
Figure 11.9	Window after removal of sash weights.	11-38
Figure 11.10	Rebuild damaged sash with filler or putty.	11-38
Figure 11.11	Wet plane edges of sash to fit new jamb liners.	11-38
Figure 11.12	Vacuum window again.	11-38
Figure 11.13	Fit sashes into jamb liners.	11-39
Figure 11.14	Reinstall sash into jamb.	11-39
Figure 11.15	Stabilizing paint on doors: Wet planning and wet sanding	11-40
Figure 11.16	Before and after stair treatments.	11-41
Figure 11.17	Covering Stairs with Tread Guards.	11-42



Figure 11.18	Shoe Molding Is an Acceptable Impact Surface Treatment for Baseboards	11-42
Figure 11.19	Corner Bead Coverings Can Be Used on Outside Corners of Walls.....	11-42
Figure 11.20	Turning a Window Sill and Trough Into a Smooth and Cleanable Surface.....	11-48
Figure 11.21	How to Use a HEPA Vacuum	11-52
Figure 11.22	Changing HEPA vacuum filter	11-54
Figure 11.23	Carpet with debris and after cleaning	11-58
Figure 11.24	Air vent before and after cleaning.....	11-59
Figure 11.25	Clean Air Vent Registers	11-59
Figure 11.26	Walk-Off Mats	11-60
Figure 11.27	Thorny Bushes as a Land Use Control.....	11-65
Figure 11.28	Using Fencing as an Interim Control.....	11-65
Figure 12.1	Removing and Replacing Trim: interior (left), exterior (right)	12-19
Figure 12.2	Protecting the interior of a unit for exterior window abatement	12-20
Figure 12.3	Replacement window system	12-20
Figure 12.4	Pre-and post-abatement interior doors	12-21
Figure 12.5	A metal railing before abatement.....	12-22
Figure 12.6	Installation of replacement siding.....	12-22
Figure 12.7	Certified workers are needed to replace siding when the project's intent is lead abatement.....	12-22
Figure 12.8	Line surfaces with plastic in the work area (left) and pathways (right)	12-23
Figure 12.9	Example of a Diagram Showing the Location of Lead-Based Paint Enclosures	12-25
Figure 12.10	Installing underlayment and new flooring as a suitable LBP enclosure method.....	12-29
Figure 12.11	Enclosed stairs	12-30
Figure 12.12	Seal All Seams for Enclosure.....	12-31
Figure 12.13	Prohibited work practices (traditional abrasive blasting (left) and grinding without HEPA exhaust).....	12-34
Figure 12.14	Using a heat gun to remove paint is labor-intensive.....	12-36
Figure 12.15	HEPA-filtered power tools	12-37
Figure 12.16	Wet scraping (left)	12-38
Figure 12.17	Scraping tools (right)	12-38
Figure 12.18	Vacuum blasting is not often used on housing	12-39
Figure 12.19	Needle Gun with HEPA Exhaust Ventilation	12-39



Figure 12.20	Workers should wear protective clothing when using chemicals	12-40
Figure 12.21	Eye- and body-wash stations are required when working with corrosive or irritant chemicals.	12-41
Figure 12.22	Replacing resident pathway after soil removal.....	12-47
Figure 12.23	Preparing to pave high traffic area	12-49
Figure 13.1	Encapsulating a floor with vinyl tiles.....	13-8
Figure 13.2	Deteriorated paint on surfaces that are unsuitable for encapsulation.....	13-8
Figure 13.3	Encapsulated historic components.....	13-13
Figure 13.4	Encapsulant failure.	13-21
Figure 14.1	There are many brands of HEPA vacuums on the market.	14-8
Figure 14.2	Vacuum with a HEPA filter and special attachments.	14-10
Figure 14.3	Sizes of HEPA vacuums and attachments.....	14-11
Figure 14.4	Three-bucket cleaning system.	14-13
Figure 14.5	HEPA vacuum and wet wash technology	14-13
Figure 14.6	Removing large debris.	14-15
Figure 14.7	Exterior clean up.....	14-16
Figure 14.8	Vacuums the floor containment.....	14-17
Figure 14.9	Inspecting for completeness of the work performed.	14-19
Figure 14.10	The HEPA Vacuum-Wet Wash-HEPA Vacuum Cycle Helps Meet Clearance Standards.	14-20
Figure 14.11	Wet Cycle Requires Washing All Surfaces with Suitable Detergents.	14-20
Figure 14.12	Use a Three-Bucket System and Then HEPA Vacuum Again to Minimize Recontamination.....	14-20
Figure 14.13	HEPA vacuum all surfaces a final time.....	14-20
Figure 15.1	Windows sealed to prevent dust migration	15-13
Figure 15.2	Visible paint chips and debris in soil	15-14
Figure 15.3	Visible dust Indicates recleaning is needed.....	15-19
Figure 15.4	Tracking of dust that may contain lead	15-19
Figure 15.5	Indications that children are present.....	15-26
Figure 15.6	A floor that may be tested.....	15-30
Figure 15.7	A windowsill and trough that may be tested.....	15-30
Figure 15.8	Window locations for dust sampling.....	15-31
Figure 15.9	Soil debris.....	15-34
Figure 15.10	Surfaces that may have been paint stripped	15-37

Figure 16.1	Health Department case managers work with parents and guardians of lead-poisoned children	16–6
Figure 16.2	Environmental investigations include sites where the child spends time.....	16–8
Figure 18.1	Delicate muntins and multi-pane sash on row houses.....	18–9
Figure 18.2	Window condition assessment.....	18–9
Figure 18.3a	Historic property before rehabilitation	18–10
Figure 18.3b	Historic property after rehabilitation.....	18–10
Figure 18.4	Wood features on historic properties	18–12
Figure 18.5	Doors to historic property before off-site stripping	18–13
Figure 18.5b	Doors to historic property after off-site stripping.....	18–13
Figure 18.6	Enclosure of stairs not appropriate in a historic property	18–14

FORMS

Form 5.0	Questionnaire for a Lead Hazard Risk Assessment of an Individual Occupied Dwelling Unit.	5–99
Form 5.1	Building Condition Form for Lead Hazard Risk Assessment.....	5–101
Form 5.2	Field Report of Visual Assessment for Lead Hazard Risk Assessment.....	5–102
Form 5.3	Field Paint Chip Sampling Form.....	5–103
Form 5.4a	Field Sampling Form for Dust. (Single-Surface Sampling).....	5–104
Form 5.4b	Field Sampling Form for Dust. (Composite Sampling)	5–105
Form 5.5	Field Sampling Form for Soil.....	5–106
Form 5.6	Questionnaire for a Lead Hazard Risk Assessment of More Than Four Rental Dwelling Units.	5–107
Form 5.7	Format for an Executive Summary of a Lead Hazard Risk Assessment.....	5–111
Form 6.0	Report of Visual Assessment (for Ongoing Lead-Safe Maintenance).....	6–35
Form 6.1	Report of Visual Assessment of Bare Soil for Lead-Safe Maintenance.....	6–36
Form 6.2	Log of Visual Assessments for Ongoing Lead-Safe Maintenance	6–37
Form 6.3	Lead-Based Paint Inventory	6–38
Form 6.3a	Completed Lead-Based Paint Inventory for a Room/Space	6–39
Form 6.4	Lead Hazard Control Inventory.....	6–40
Form 6.5	Lead-Safe Maintenance Work Order	6–41



Lead-Based Paint Inspection Forms	After 7–61
Form 7.1	Single Family Housing LBP Testing Data Sheet – Blank
Form 7.1	Single Family Housing LBP Testing Data Sheet – Completed
Form 7.2	Calibration Check Test Results – Blank
Form 7.2	Calibration Check Test Results – Completed
Form 7.3	Substrate Correction Values – Blank
Form 7.3	Substrate Correction Values – Completed
Form 7.4	Selection of Housing Units – Blank
Form 7.4	Selection of Housing Units – Completed
Form 7.5	Multi-family Housing LBP Testing Data Sheet – Blank
Form 7.5	Multi-family Housing LBP Testing Data Sheet – Completed
Form 7.6	Multi-family Housing: Component Type Report – Blank
Form 7.6	Multi-family Housing: Component Type Report – Completed
Form 13.1	Encapsulant Patch Test Documentation 13–23
Form 13.2	Lead-Based Paint Encapsulation Visual Monitoring Form 13–27
Form 15.1	Visual Assessment - Lead Hazard Clearance Examination..... 15–45
Form 15.2	Field Sampling Form for Dust - Lead Hazard Clearance Examination (single-surface sampling)..... 15–46
Form 15.3	Lead Hazard Clearance Report – Completed Example..... 15–47
Form 15.4	Clearance Report Review Worksheet 15–53
Form 15.5	Clearance Report Review Worksheet –Completed Example 15–54
Form 16.1	Resident Questionnaire for Investigation of Children with Elevated Blood Lead Levels (EBL) 16–23

TABLES

Table 2.1	Owner Responsibilities 2–4
Table 3.1	Summary of Steps in Planning Lead Hazard Control Projects..... 3–7
Table 3.2	Housing Units with Lead-Based Paint or Significant Lead-Based Paint Hazards 3–9
Table 4.1	Similarities between Lead Hazard Control and Renovation..... 4–5
Table 5.1	Comparison of Risk Assessment, Lead Hazard Screen, Lead-Based Paint Inspection, and Combination Inspection/Risk Assessment 5–10
Table 5.2	Percentage of Housing Units with Significant Lead-Based Paint Hazards, and Percentage with Bare Soil Lead Levels in Yard > 1200 ppm, United States, 2005-2006 5–14
Table 5.3	Percentage of Component Types Coated with Lead-Based Paint, by Year of Construction, and by Interior or Exterior Location, United States, 2000 5–16



Table 5.4	Illustrative List of Painted Components*.....	5–27
Table 5.5	Review of Previous Lead-Based Paint Inspections.	5–50
Table 5.6	Recommended Number of Play Areas To Be Sampled.....	5–57
Table 5.7	Recommended Number of Non-play Areas of Dripline/Foundation Areas.	5–58
Table 5.8	Recommended Number of Soil Samples in Non-play Areas of the Rest of the Yard Outside of Dripline/Foundation Areas.	5–59
Table 5.9	Risk Assessment Approach for Evaluations of Different Size.....	5–63
Table 5.10	Minimum Number of Targeted Dwellings to Be Sampled Among Similar Dwellings (random sampling may require additional units).	5–68
Table 5.11	Federal Hazard Levels for Lead Hazard Risk Assessments*	5–73
Table 5.12	Main Hazard Control Options That Could Be Identified in Risk Assessments Based on Actual Conditions.....	5–87
Table 5.13	Paint-Lead Hazards.....	5–92
Table 5.14	Soil-Lead Hazards	5–92
Table 5.15	Dust-Lead Hazards.....	5–93
Table 7.1	Examples of Interior and Exterior Building Component Types.....	7–18
Table 7.2	Examples of Distinct Testing Combinations	7–19
Table 7.3	Number of Units to Be Tested in Multi-family Building and Developments	7–38
Table 8.1	Interior Worksite Preparation (Not Including Windows)	8–13
Table 11.1	Finish Coats for Paint Stabilization.....	11–32
Table 11.2	Sticky Tape Technique for Removing Loose Paint on Impact Surfaces for Owner/Occupants or Residents.....	11–43
Table 11.3	Potential Sources of Lead-Containing House Dust.....	11–46
Table 11.4	Major Dust Reservoirs and Potential Dust Traps	11–47
Table 11.5	Rug Cleaning Steps and Approximate Time Per 10 Square Feet.....	11–57
Table 11.6	Grasses and Their Appropriate Applications.....	11–66
Table 12.1	Prohibited Lead-Based Paint Abatement Methods.....	12–13
Table 12.2	Comparison of Lead-Based Paint Abatement, Removal and Enclosure.....	12–17
Table 12.3	Steps To Install Drywall and Fiberboard on Interior Walls.	12–27
Table 13.1	Advantages and Disadvantages of Using Encapsulants.....	13–7
Table 13.2	Categories of Encapsulants.....	13–10
Table 13.3	Steps for Obtaining Proper Application and Installation of an Encapsulant System.....	13–22
Table 14.1	Summary Guidance on Cleaning Methods by Dustiness of Work and Condition of the Surface.	14–18



Table 15.1	Recommended Minimum Number and Location of Dust Samples.....	15–27
Table 15.2	Clearance Dust Standards (Single-Surface Wipe Samples).....	15–39
Table 15.3	Clearance Dust Standards (Composite Wipe Samples).....	15–41
Table 15.4	Hypothetical Example of Single-Surface Clearance Dust Sampling Data.	15–41
Table 15.5	Hypothetical Example of Composite Clearance Dust Sampling Data.	15–41
Table 16.1	Summary of Recommendations for Assessment and Remediation of Residential Lead Exposure.....	16–10
Table 16.2	Guidelines for Questions to Ask Regarding a Child’s Environmental History	16–12
Table 16.3	Common Sources of Lead Exposure to Consider in an Environmental Investigation	16–13
Table 16.4	Published Reports of Less Common Causes of Elevated Blood Lead levels (EBLs) in Children.....	16–16

Chapter 1: Introduction

I. Legislative Basis and Relationship to Federal Programs and Regulations.....	1-3
A. Legislative Basis	1-3
B. Intended Audience	1-3
II. Background on Childhood Lead Poisoning, Sources of Lead in the Environment, and the Evolution of Lead Poisoning Prevention	1-4
A. Childhood Lead Poisoning.....	1-4
1. Health Hazards	1-4
2. Prevalence Rates.....	1-5
3. Highest Risk Populations	1-5
4. Health Screening.....	1-5
5. Updated CDC Recommendations	1-6
B. Causes of Childhood Lead Poisoning	1-6
1. Lead in Residential Paint	1-6
2. Lead-Based Paint in Housing.....	1-6
3. Lead in Surface Dust.....	1-7
4. Lead in Soil.....	1-7
5. Other Causes of Lead Poisoning	1-8
C. The Evolution of Prevention Approaches.....	1-8
1. Medical Treatment of Poisoned Children (Tertiary Treatment).....	1-8
2. Screening and Case Management Programs (Secondary Prevention).....	1-8
3. Primary Prevention	1-9
III. The Title X Regulatory Framework	1-9
A. Definition of “Lead-Based Paint Hazard”	1-9
B. Regulatory Framework for Lead Hazard Control	1-10
1. Evaluating Lead Hazards	1-11
2. Controlling Lead Hazards.....	1-12
C. Requirements To Ensure Quality Control	1-13
1. Training and Certification	1-13
2. Accreditation of Training Providers	1-13
3. Health-Based Standards	1-13
4. Performance Standards for Testing and Abatement Products.....	1-13
5. Laboratory Accreditation	1-14
D. State and Local Regulations.....	1-14
IV. Organization and Use of the Guidelines	1-14
A. Chapter Organization	1-14
1. Chapters 1-4: Background Information.....	1-14
2. Chapters 5-7: Hazard Evaluation and Ongoing Maintenance.....	1-15
3. Chapters 8-10: Preparation for the Project	1-15



4. Chapters 11-15: Hazard Control, Cleanup, and Clearance.....	1-15
5. Chapters 16-18: Related Issues.....	1-16
6. Glossary and Appendices.....	1-16
B. Units of Measurement.....	1-16
C. Federal Lead Standards	1-17
REFERENCES.....	1-18

FIGURES

Figure 1.1 Some paints contained 50% lead and were aggressively marketed	1-6
Figure 1.2 Deteriorated residential paint on house trim.....	1-7
Figure 1.3 Paint deterioration.	1-7
Figure 1.4 Title X's Lead Hazard Control Framework	1-11

Chapter 1: Introduction

I. Legislative Basis and Relationship to Federal Programs and Regulations

A. Legislative Basis

The *Guidelines* are issued pursuant to Section 1017 of the Residential Lead-Based Paint Hazard Reduction Act of 1992, which is often referred to as Title X (“Title Ten”) because it was enacted as Title X of the Housing and Community Development Act of 1992 (Public Law 102-550). The *Guidelines* are based on the concepts, definitions, and requirements set forth in Title X. Section III of this chapter describes the framework of concepts and definitions in Title X and the regulations issued pursuant to it.

As required by Section 1017, the *Guidelines* must be used for “federally supported work,” which is defined in the Act as “any lead hazard evaluation or reduction activities conducted in federally owned or assisted housing or funded in whole or in part through any financial assistance program” of the Department of Housing and Urban Development, the Department of Agriculture or the Department of Veterans Affairs. The Act defines “federally owned housing” as “residential dwellings owned or managed by a Federal agency, or for which a Federal agency is a trustee or conservator.” In this context, the term “Federal agency” includes HUD, the Department of Agriculture’s Rural Development – Housing and Community Facilities Programs, the Savings Association Insurance Fund, the General Services Administration, the Department of Defense, the Department of Veterans Affairs, the Department of the Interior, and the Department of Transportation. The term “federally assisted housing” is defined in the Act as “residential dwellings receiving *project-based* assistance under programs including:

“(A) section 221(d)(3) or 236 of the National Housing Act;

“(B) section 1 of the Housing and Urban Development Act of 1965;

“(C) section 8 of the United States Housing Act of 1937; or

“(D) sections 502(a), 504, 514, 515, 516 and 533 of the Housing Act of 1949.”

B. Intended Audience

These *Guidelines* were developed and have been revised to provide technical guidance to the many individuals and groups involved with, or affected by, lead-based paint in residential housing units, and, to the extent appropriate, child-occupied facilities (see Appendix 6) including:

- ◆ Lead-based paint abatement contractors and abatement supervisors.
- ◆ Residential renovation contractors.
- ◆ Residential painters and painting contractors.
- ◆ Building maintenance personnel.
- ◆ Lead-based paint risk assessors, paint inspectors and sampling technicians.
- ◆ Lead-based paint training providers.
- ◆ Contractor certifying or licensing agencies.

- ◆ Residential building owners and managers, including: public housing agencies and Tribally-Designated Housing Entities (TDHEs); private, nonprofit housing development organizations; and private, for-profit landlords, managers, and building owners.
- ◆ Federal agency staff, such as from HUD, EPA, CDC, USDA, GSA, DoD, VA, DOI, DOT, and other agencies that own or manage residential properties and/or child-occupied facilities.
- ◆ State and local housing and community development agencies.
- ◆ State and local health agencies.
- ◆ Architects and designers.
- ◆ Environmental laboratory personnel.
- ◆ Environmental laboratory accreditation organizations.
- ◆ Real estate agents and brokers.
- ◆ Property and casualty insurers.
- ◆ Lenders and appraisers.

These *Guidelines* are intended for use by trained and certified lead-based paint professionals. Under HUD and EPA regulations, contractors and individuals must be trained and/or certified to conduct inspections, risk assessments, lead-based paint hazard reduction activities, and clearance examinations. Firms performing renovations that disturb lead-based paint (including interim controls) must be certified in Renovation, Remodeling and Repair, and have an adequate number of Certified Renovators on each job to perform the job safely. Federal agencies have developed different resources for non-professionals, such as the “Lead Paint Safety Field Guide.” Various outreach and education documents are posted at: <http://www.epa.gov/lead/pubs/leadpbed.htm>, or may be requested by calling the National Lead Information Center at 1-800-424-LEAD (toll-free). Hearing- or speech-challenged individuals may access this number through TTY by calling the toll-free Federal Relay Service at 800-877-8339.

II. Background on Childhood Lead Poisoning, Sources of Lead in the Environment, and the Evolution of Lead Poisoning Prevention

As understanding of lead’s adverse health effects and the sources and pathways of exposure to children has improved, so has recognition of the seriousness of lead-based paint hazards.

A. Childhood Lead Poisoning

Despite steady and impressive progress in reducing blood-lead levels (BLLs) among the U.S. population, childhood lead poisoning remains a major preventable environmental health problem in the United States.

1. Health Hazards

Lead is highly toxic and affects virtually every system of the body. At high exposure levels, lead poisoning can cause convulsions, coma, and death. While adults can also suffer from excessive

lead exposures (discussed in Chapter 9), the groups most at risk are fetuses, infants, and children under age 6. At low levels, lead's neurotoxic effects have the greatest impact on children's developing brains and nervous systems, causing reductions in IQ and attention span, reading and learning disabilities, hyperactivity, and behavioral problems (Davis, 1993). These effects have been identified in many carefully conducted research studies (see the literature review in National Academy of Sciences, 1993). However, the vast majority of childhood lead poisoning cases go undiagnosed and untreated, because most poisoned children have no obvious symptoms.

2. Prevalence Rates

In October 1991, CDC formally revised its statement on *Preventing Lead Poisoning in Young Children* (CDC, 1991a), reducing its "level of concern" for childhood lead poisoning from the previous threshold of 25 micrograms/deciliter ($\mu\text{g}/\text{dL}$) to 10 $\mu\text{g}/\text{dL}$. (See section IV.B, below for a description of units of measurement for lead in blood, paint, dust, soil, air, and water.) This change was based on scientific evidence indicating that adverse health effects can occur at levels as low as 10 $\mu\text{g}/\text{dL}$. In August 2005, CDC estimated that 310,000, or 0.7%, of American children under age 6 have BLLs above 10 $\mu\text{g}/\text{dL}$ (CDC, 2005). More recent research suggests that such effects occur at levels well below 10 $\mu\text{g}/\text{dL}$ (see, e.g., the literature review in CDC ACCLPP, 2012). No blood lead threshold for adverse health effects has been identified in children.

3. Highest Risk Populations

Lead poisoning affects children across all socioeconomic strata and in all regions of the country. However, because lead-based paint hazards are most severe in older, dilapidated housing, the poor in inner cities are disproportionately affected. In many such neighborhoods over half of all young children have lead poisoning. The National Health and Nutrition Examination Survey (NHANES) reported that, in 1999-2002, non-Hispanic blacks and Mexican Americans had higher percentages of elevated BLLs than non-Hispanic whites (Schwemberger, 2005). Although the disparity in risk for BLLs greater than or equal to 10 $\mu\text{g}/\text{dL}$ by income and race are no longer statistically significant; disparities by race/ethnicity and income still persist at lower blood lead levels (Jones, 2009).

4. Health Screening

In 1990, CDC called for a phase-in of universal blood-lead testing of all young children (unless it can be shown that the community has no lead poisoning problem) because most poisoned children do not exhibit easily identifiable symptoms and virtually all children are at risk (CDC, 1991b). The Medicaid Guidelines called for all children under age 6 to be tested (CMS, 1998). In 1993, the American Academy of Pediatrics (AAP) also revised its policy to recommend the routine screening of virtually all young children under age 6 (AAP, 1993). Because lead risk varies considerably by geography, CDC in 1997 recommended that State and local health departments assess local data on lead risks and develop lead-screening recommendations for health care providers in their jurisdictions, focusing on 1- and 2-year old children (CDC, 1997). CDC updated its statement in 2005 (see the Executive Summary in Appendix 16), while the U.S. Preventive Services Task Force (convened by the CDC) found that screening in asymptomatic children has not been demonstrated to be effective in improving clinical outcomes (Risshitelli, 2006).

5. Updated CDC Recommendations

CDC recommends that sources of lead in children’s environments be controlled or eliminated before children are poisoned, i.e. “primary prevention” (CDC, 2007; CDC, 2012a). CDC “emphasize[s] the importance of environmental assessments to identify and mitigate lead hazards before children demonstrate BLLs at or higher than the reference value” and has “adopt[ed] prevention strategies to reduce environmental lead exposures in soil, dust, paint, and water before children are exposed” through action by itself and others. Various counseling, monitoring, and community-wide prevention activities are recommended at various BLLs. Given that no safe blood lead level threshold in children has been identified, in 2012 CDC eliminated the use of a “blood lead level of concern” and redoubled its primary prevention efforts that remove lead before children are exposed. (CDC, 2012a) For further information, see Chapter 16.

B. Causes of Childhood Lead Poisoning

Today, children in the United States are lead poisoned primarily through ingestion of lead-containing dust by normal hand-to-mouth and toy-to-mouth activity. Because lead is ubiquitous in industrial societies, there are many sources and pathways of lead exposure.

1. Lead in Residential Paint

The foremost cause of childhood lead poisoning in the United States today is lead-based paint and the accompanying contaminated dust and soil found in older houses (CDC, 1991b; Rabinowitz, 1985b; Jacobs, 1994). As early as 1897, lead-based paint was identified as a cause of childhood lead poisoning (Turner, 1897; Reich, 1992; Markowitz, 2000; Warren, 2002; Bellinger, 2006). Many countries prohibited the use of lead in residential paints as far back as 1922 (Rabin, 1989). Lead was a major ingredient in most interior and exterior oil house paints before 1950, with some paints containing as much as 50 percent lead by dry weight (see *Figure 1.1*). In the early 1950s, other ingredients became more popular, but some lead pigments, corrosion inhibitors, and drying agents were still used. Lead was first regulated in residential paint in 1972 at 0.5 percent and “banned” in 1978, meaning that paint could contain no more than 0.06 percent (600 parts per million) lead by dry weight (Rabin, 1989; Reich, 1992). The Consumer Product Safety Improvement Act of 2008 (Public Law 110-314) reduced the threshold to 0.009 percent (90 parts per million) lead by dry weight (CPSC, 2008).

2. Lead-Based Paint in Housing

HUD estimates that 38 million housing units have lead-based paint (Jacobs, 2002). The likelihood, extent, and concentration of lead-based paint increase with the age of the building.

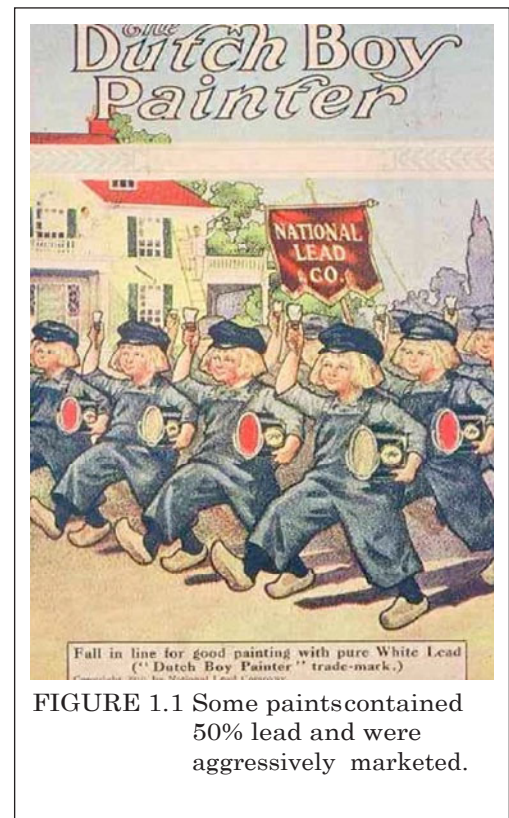


FIGURE 1.1 Some paints contained 50% lead and were aggressively marketed.



FIGURE 1.2 Deteriorated residential paint on house trim.



FIGURE 1.3 Paint deterioration.

Because the greatest risk of paint deterioration is in dwellings built before 1950, older housing generally commands a higher priority for lead hazard controls (see Figures 1.2 and 1.3). (See Chapter 5 for lead-based paint prevalence data by building component type and prevalence of housing with significant lead-based paint hazards by year of construction.)

3. Lead in Surface Dust

The belief that in order to be poisoned children must eat lead-based paint chips is unfounded. The most common cause of poisoning is the ingestion – through hand-to-mouth transmission – of lead-contaminated

surface dust (Clark, 1991; Bellinger, 1991; Roberts, 1991; Chisolm, 1985; Farfel and Chisolm, 1990; Farfel, 1994a; Lanphear, 1998). HUD estimates that 15.5 million housing units have levels of lead in interior dust that exceed EPA standards (Jacobs, 2002). Lead-contaminated dust may be so fine that it cannot be seen by the naked eye. In addition, lead-contaminated dust is difficult to clean up. Leaded-dust is generated as lead-based paint deteriorates over time, is damaged by moisture, abraded on friction and impact surfaces, or disturbed in the course of renovation, repair, or abatement projects. Lead can also be tracked into homes from exterior dust and soil. Since Congress also defined lead found in dust and soil to be lead-based paint hazards, these *Guidelines* address lead in surface dust and soil as well as in paint.

4. Lead in Soil

Children can also be exposed to lead in bare soil. HUD estimates that almost 5 million housing units have levels of lead in soil that exceed EPA standards (Jacobs, 2002). The high levels of lead in soil typically come from deteriorating exterior lead-based paint around the foundation of a house (Ter Harr, 1974; Linton, 1980). The fallout of lead emissions from the combustion of leaded-automobile gasoline, lead-based paint, and industrial sources also contributes to lead levels in soil (ATSDR, 1988). In some areas high leaded-soil levels result from factory and smelter emissions or deteriorating lead-based paint on steel structures, such as bridges. Bare soil that is contaminated with lead poses a hazard to children who play in it. Lead in soil may also be tracked into a home, increasing interior levels of dust lead. These *Guidelines* address lead-contaminated soil, as well as lead-based paint and lead-contaminated dust.

5. Other Causes of Lead Poisoning

Other sources and pathways of lead poisoning in children can include drinking water, point sources (such as smelters or industrial dischargers), ceramics, toys, children's jewelry, lead brought home from a parent's workplace, imported candy and its candy wrappers, home and folk remedies, cosmetics, and hobbies (such as casting lead sinkers or toy soldiers, making stained glass, loading ammunition, and soldering). These sources may account for some children's exposure; however, for most children, paint, dust, and soil are the primary sources of lead poisoning. For additional and more recent information, go to CPSC home page, <http://www.cpsc.gov/>, look on that home page for recent news and click on "CPSC Publications." You may then click on "Find Publications by Specific Topic" to search for Lead and/or for Lead-based paint. If you click on the Spanish header to the CPSC Publications page, you may search for "plomo" in "Publicaciones en Español." You may also visit the CDC Lead Poisoning Prevention Program home page: <http://www.cdc.gov/nceh/lead/>.

C. The Evolution of Prevention Approaches

The approach to identifying and responding to lead-based paint hazards and how they poison children in American housing has evolved over the past several decades.

1. Medical Treatment of Poisoned Children (Tertiary Treatment)

During the 1940s and 1950s, deaths from childhood lead poisoning were common. Using chelation therapy (the use of drugs to excrete lead from the body), medical providers attempted to treat symptomatic cases to prevent death, with the assumption that children who survived had been cured. During the 1950s, studies in Chicago (Williams, 1952), New York City (McLaughlin, 1956), and Baltimore (Chisolm, 1956) demonstrated conclusively that children who survived serious lead poisoning were often left mentally retarded or otherwise permanently impaired (Lin-Fu, 1982). More recent chelating agents are D-penicillamine and succimer (WebMD, 2010 at <http://emedicine.medscape.com/article/815399-treatment>). Chelation therapy should only be undertaken in consultation with a medical doctor with experience in the chelation of children for lead poisoning.

2. Screening and Case Management Programs (Secondary Prevention)

Recognition of these neurological problems gave rise to expanded screening and case management programs in many cities and states. Before the late 1980's, the traditional approach to childhood lead poisoning prevention was reactive, relying on the identification of a poisoned child to trigger investigation of lead hazards in the home environment. Based on the belief that children had to eat lead-based paint chips to be poisoned, the typical response to a lead poisoning during the 1970s and early 1980s consisted of removing deteriorated lead-based paint by scraping, uncontrolled sanding, or open flame burning. Approaches differed slightly, depending on the jurisdiction. Some jurisdictions required removal of all lead-based paint below a certain height, such as 5 feet; others required only that deteriorating paint be removed. However, these traditional abatements had one common characteristic: little attention was paid to controlling, containing, and cleaning up leaded-dust. In many cases these paint removal methods actually aggravated the problem and increased lead exposures,

poisoning workers and children in the process. Several studies found that uncontrolled abatement and inadequate cleanup caused increased blood-lead levels (Farfel and Chisolm, 1990; Rabinowitz, 1985a; Amitai, 1987).

3. Primary Prevention

As knowledge about lead poisoning increased, Congress concluded that responding to poisoned children was an ineffective solution to the nationwide problem. Legislation reflected a shift toward primary prevention. During the 1980s, HUD's requirements regarding treatment of lead-based paint were similarly amended. Department-wide regulatory revisions pertaining to lead-based paint in certain programs were made in 1986, 1987 and 1988. Housing and community development regulations began to include primary prevention strategies such as requiring inspections of pre-1978 public housing and abatement during substantial rehabilitation. HUD's 1990 *Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing (Interim Guidelines)*, which evolved from the 1987 Housing and Community Development Act, emphasized the danger of lead-contaminated dust and the need for worker protection and thorough cleanup. HUD's Office of Public and Indian Housing revised its program provisions in 1991, and made important changes in 1995 to the Housing Quality Standards (HQS), which apply to Section 8 tenant-based rental assistance and certain other HUD programs. When Title X was signed in 1992, primary prevention was included in the national strategy. The first edition of the final *Guidelines* was issued in 1995 and, as a documented methodology, has been incorporated by reference into many states' lead laws. The data demonstrating that no "safe" threshold for blood lead levels in young children has been identified highlights the importance of preventing childhood exposures to lead. It confirms the need for a systematic and society-wide effort to control or eliminate lead hazards in children's environments before they are exposed. In 2005, CDC specifically focused on primary prevention and published *Preventing Lead Poisoning in Young Children* (CDC, 2005).

III. The Title X Regulatory Framework

Title X fundamentally reorganized the national approach to controlling lead-based paint hazards in housing by focusing attention on lead hazards through the establishment of new requirements for property owners as well as Federal agencies and mandating action to improve the safety and effectiveness of lead-based paint activities.

A. Definition of "Lead-Based Paint Hazard"

Title X redefined the concept of "lead-based paint hazards." Under earlier Federal legislation (Housing and Community Development Act of 1987; Public Law 100-242), a lead-based paint hazard was defined as any paint containing 1 mg/cm² or more of lead regardless of its condition or location. Title X states that a lead-based paint hazard is "any condition that causes *exposure* to lead from lead-contaminated dust, lead-contaminated soil, or lead-contaminated paint that is deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects..." (emphasis added, 42 U.S.C. 4851b(15)). Thus, under this definition, intact lead-based paint on most walls and ceilings is not considered a "hazard," although the condition of the paint should be monitored and maintained to ensure that it does not deteriorate. While most efforts to reduce lead hazards in housing will now be aimed at controlling lead-based paint hazards as defined by Title X,

Federal law makes one notable exception: in public housing and Tribally-Designated Housing Entities, all lead-based paint must be abated when the housing is modernized.

B. Regulatory Framework for Lead Hazard Control

As directed by the Congress in Title X, HUD, EPA, OSHA, and CDC have issued the following regulations and guidelines with respect to the evaluation and control of lead-based paint hazards in housing (Refer to Appendix 6):

- ◆ HUD and EPA jointly: Requirements for Disclosure of Known Lead-Based Paint and/or Lead-Based Paint Hazards Upon Sale or Lease of Residential Property (HUD: 24 CFR Part 35, subpart A; EPA: 40 CFR Part 745, subpart F).
- ◆ HUD: Requirements for Notification, Evaluation and Reduction of Lead-Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance, known as the HUD Lead Safe Housing Rule (24 CFR Part 35, subparts B-R).
- ◆ EPA: Requirements for Lead-Based Paint Activities in Target Housing and Child Occupied Facilities; Requirements for Hazard Education Before Renovation of Target Housing; Identification of Dangerous Levels of Lead; Renovation, Repair, and Painting. (40 CFR Part 745).
- ◆ OSHA: Interim Lead in Construction Standard (29 CFR 1926.62).
- ◆ CDC: CDC Response to Advisory Committee on Childhood Lead Poisoning Prevention Recommendations in “Low Level Lead Exposure Harms Children: A Renewed Call of Primary Prevention.” (CDC, 2012a). Preventing Lead Poisoning in Young Children (CDC, 2005); Managing Elevated Blood Lead Levels Among Young Children (CDC, 2002); and Screening Young Children for Lead poisoning: Guidance for State and Local Public Health Officials (CDC, 1997).

These regulations and guidelines constitute the Federal regulatory framework for the evaluation and control of lead-based paint hazards in housing, as of the publication of this second edition of the *Guidelines*. Future regulations, including revisions of existing regulations, are possible; the agencies’ websites should be checked for regulatory updates.

There are three Federal government initiatives that may affect the way lead-based paint issues are defined and dealt with in the future. In January 2012, an advisory committee to the CDC recommended that CDC no longer use the term “level of concern”, but use a childhood blood lead level reference value of 5 µg/dL, with possible future reductions (CDC ACCLPP, 2012); CDC considered the committee’s recommendations in formulating its policies, which it published on May 16, 2012 (CDC, 2012a). CDC adopted the core recommendation of eliminating the term “level of concern” from its future policies, guidance documents, and other CDC publications, and it will use a childhood blood lead level (BLL) reference value based on the 97.5th percentile of the population BLL in children ages 1-5 (5 µg/dL as of the publication of this edition of these *Guidelines*) to identify children and environments associated with lead-exposure hazards. CDC also adopted the recommendation that the reference value should be updated by CDC every four years based on the most recent population based blood lead surveys among children. CDC’s response to the other recommendations is provided in their full response. At the same time, CDC also issued Fact Sheet: Blood Lead Levels in Children – Important Information for Parents, providing parents and other concerned individuals with an update on this issue (CDC, 2012b). documents.

1. Evaluating Lead Hazards

The principal lead hazard evaluation methods are 1) risk assessment or lead hazard screen, 2) risk assessment combined with lead-based paint inspection, and 3) lead-based paint inspection combined with visual assessment (see *Figure 1.4*). Alternatives to evaluation include visual assessment and the presumption that lead-based paint and/or lead-based paint hazards are present.

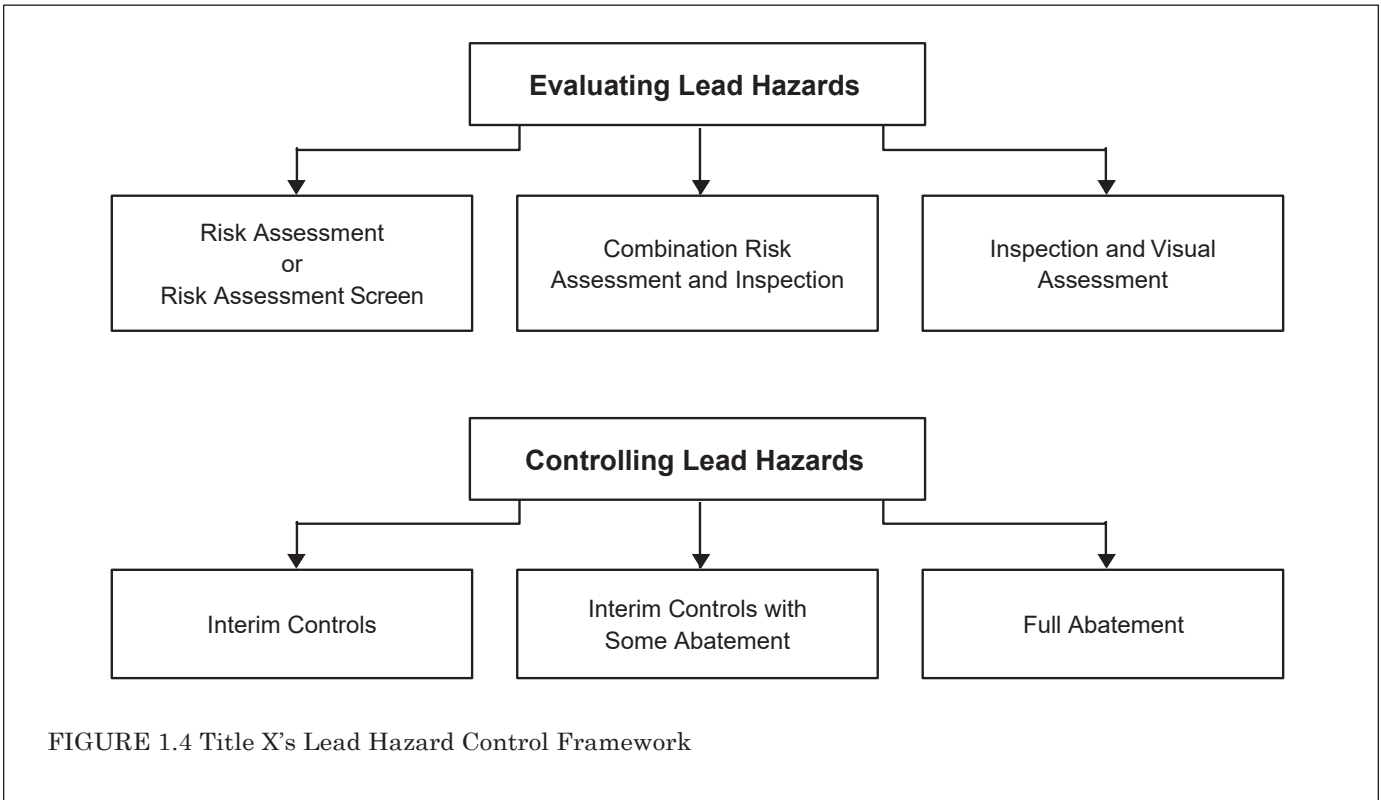


FIGURE 1.4 Title X's Lead Hazard Control Framework

“Risk assessment” is an onsite investigation of a residential building for lead-based paint hazards and includes, but may not be limited to: a visual inspection; targeted environmental sampling of dust, soil, and deteriorated paint; and a report of the results that identifies acceptable abatement and interim control strategies for controlling any identified lead-based paint hazards. Risk assessments and paint inspections can be combined to provide a more comprehensive evaluation of lead hazards (see Chapters 3, 5 and 7).

“Lead hazard screen” is a limited assessment of hazards performed in accordance with the methods and standards made by the state or EPA, as appropriate. A lead hazard screen may identify the need for a follow-up risk assessment.

“Paint inspection” is a surface-by-surface investigation of all painted surfaces – interior and exterior – in common areas of multi-family buildings, as well as in dwelling units. The inspection uses portable X-ray fluorescent (XRF) analyzers and/or laboratory analysis of paint samples to determine the presence of lead-based paint, and provides a report of the results. Inspections to identify the presence of lead-based paint should not be confused with clearance examinations, risk assessments, or investigations of homes with lead-poisoned children. Adding a visual assessment will identify the presence of deteriorated paint that is a hazard.

“**Visual Assessment**” alone is an alternative to evaluation. Under some circumstances, such as for dwelling units occupied by families with tenant-based rental assistance or as part of ongoing lead-based paint maintenance, property owners or housing quality inspectors may conduct a visual assessment to identify any deteriorated paint, unusual amounts of visible dust, or other conditions that suggest the possible existence of lead hazards. HUD does not consider a visual assessment by itself to constitute an “evaluation” because it does not include a scientific test for the presence of lead. Nevertheless, a visual assessment that is combined with a lead-based paint inspection can identify the presence of lead-based paint hazards.

“**Presumption**” is another alternative to evaluation. Property owners may presume that all painted surfaces are coated with lead-based paint and that all bare soil is hazardous, so long as they treat all surfaces to be disturbed as if they contain lead. Such a presumptive approach may be cost-effective in the case of pre-1960 housing in poor condition. Presumption is specifically included in the Lead Safe Housing Rule.

2. Controlling Lead Hazards

Title X provides for three types of lead hazard control: interim controls; abatement of lead-based paint hazards; and complete abatement of all lead-based paint (see Figure 1.4). Interim control and abatement activities are frequently combined in lead hazard control projects. Other construction activities, such as renovation and remodeling, rehabilitation, and weatherization, also may treat some or all lead hazards. These *Guidelines* recommend procedures that increase the safety and effectiveness of all types of construction projects that are carried out in housing that might contain lead-based paint, regardless of the intent.

The three types of lead hazard control are described as follows:

Interim controls, according to Title X, are “a set of measures designed to reduce temporarily human exposure or likely exposure to lead-based paint hazards, including specialized cleaning, repairs, maintenance, painting, temporary containment, ongoing monitoring of lead-based paint hazards or potential hazards, and the establishment and operation of management and resident education programs.” Interim controls include cleaning surfaces of dust, paint film stabilization and friction and impact surface treatments. Interim controls are appropriate for implementation on a broad scale. Research has found them to be cost-effective in many cases (NCHH, 2004). Whenever interim controls are employed, the property owner should undertake ongoing maintenance of lead-based paint, as some potential hazards may still be present and new hazards may be created. Interim controls are essentially renovation and repair items, and fall under the EPA’s RRP rule.

Abatement of lead-based paint hazards, according to Title X, is “a set of measures designed to permanently eliminate lead-based paint hazards....” Such measures include: “(A) the removal of lead-based paint and lead-contaminated dust, the permanent containment or encapsulation of lead-based paint, the replacement of lead painted surfaces or fixtures, and the removal or covering of lead-contaminated soil; and (B) all preparation, cleanup, disposal, and post-abatement clearance testing activities associated with such measures.” Title X redefined the term “abatement” to mean the elimination of “lead-based paint hazards” to last for a period of twenty years, not necessarily removal of all lead-based paint.

Full abatement of lead-based paint is where all lead-based paint has been abated and clearance has been achieved. When paint removal is the abatement method used, the property has achieved the status of “lead-based paint free.” This can exempt the property from the Lead Safe Housing Rule, although disclosure of knowledge is still necessary for sale of target housing. If hazards are abated by encapsulation or enclosure, lead-based paint on the property would remain, and the property would not be “lead-based paint free.”

C. Requirements To Ensure Quality Control

To ensure that lead hazard control work is carried out safely and effectively, Title X imposed a number of requirements for consistency and quality control.

1. Training and Certification

EPA requires that all risk assessors, lead-based paint inspectors, dust sampling technicians, abatement supervisors, abatement workers, and renovation supervisors (“certified renovators”), who receive compensation for their work in target housing or pre-1978 child-occupied facilities that is not exempt from the applicable regulations, meet minimum training requirements and be certified by EPA or by an EPA-authorized State or Tribal program (40 CFR §§ 745.227 or 745.324). Workers on federally assisted abatement, interim control, maintenance or rehabilitation projects in target housing must meet HUD-approved training requirements (24 CFR §§ 35.1325 or 35.1330); since the EPA’s Renovation, Repair, and Painting (RRP) Rule went into effect in 2010, HUD’s lead-safe work practices training requirement is satisfied by EPA’s renovation certification training requirement. Technicians who collect dust samples in connection with clearance examinations (sampling technicians) after renovation and rehabilitation (but not abatement) must meet EPA and, if applicable, HUD training requirements (40 CFR 745.90 and 24 CFR 35.1340). Training is generally not provided by EPA or HUD, but is provided by the private sector and some state, local, and tribal governments.

2. Accreditation of Training Providers

EPA requires that every training program delivering courses for lead certification for activities in target housing and pre-1978 child-occupied facilities be accredited by either EPA or an EPA-authorized State or Tribal certification program.

3. Health-Based Standards

EPA has identified standards for dangerous levels of lead in household dust, soil, and paint, as set forth in section IV.C of this chapter, for use in risk assessments and for clearance after completion of lead hazard control activities.

4. Performance Standards for Testing and Abatement Products

HUD and EPA have established criteria, testing protocols, and performance standards checklists for lead-based paint evaluation and hazard reduction products. The American Society for Testing and Materials has also developed a number of such standards. Those criteria, protocols, performance characteristics and standards are reflected in these *Guidelines*.

5. Laboratory Accreditation

Laboratories analyzing environmental samples of lead in paint film, dust, and soil must be recognized by EPA under the National Lead Laboratory Accreditation Program (NLLAP). A state-by-state list of NLLAP-recognized laboratories is provided on the Internet at <http://www.epa.gov/lead/pubs/nllaplist.pdf>.

D. State and Local Regulations

Many States and some local governments have issued regulations governing lead hazard evaluation and control. If there is a difference between Federal, State and local regulations, the more stringent applicable requirements must be observed in any given jurisdiction.

IV. Organization and Use of the Guidelines

Evaluation and control of lead-based paint hazards is an evolving field. For cases in which research has demonstrated that certain techniques are appropriate, references are cited. In some cases, laws or regulations specify how something is to be done; in other cases, no or an insufficient amount of research has been done to describe clearly the best approach to solving a specific problem. Recognizing that problems require answers, these *Guidelines* offer advice based on the experience and considered judgment of the authors and reviewers, and on the applicable laws and regulations. For cases in which citations are not provided, the reader should assume that the source of the advice is anecdotal and is the best advice that HUD can provide at this time.

A. Chapter Organization

A short summary of steps is provided at the beginning of each technical chapter to alert the reader to especially critical points and action steps. In general, the material is presented in each chapter in order of sequence in a typical project; however, a complete reading and understanding of these *Guidelines* is essential before any project is undertaken. Wherever possible, the *Guidelines* explain the rationale for recommendations and provide a technical description of the action to be taken.

1. Chapters 1-4: Background Information

Understanding the background material is critical to the successful completion of any project.

Chapter 1, *Introduction*, describes the purpose and application of the *Guidelines*; briefly reviews the hazards of lead-based paint in housing; summarizes major departures from past approaches; and provides context in terms of Federal law, regulations, and agency programs.

Chapter 2, *Where To Go for Help-Qualifications and Roles*, introduces the types of individuals involved in evaluating and controlling lead-based paint hazards in housing, explains their roles, and summarizes their qualifications.

Chapter 3, *Before You Begin the Project-Planning to Control Lead Hazards*, identifies the critical issues that must be examined to avoid problems and mistakes that can result in project delays and cost overruns.

Chapter 4, *Lead-Based Paint and Housing Renovation*, provides general advice on how to carry out work in older housing so that lead hazards are not inadvertently created (e.g., by disturbing lead-based paint) and how to combine renovation with abatement work.

2. Chapters 5-7: Hazard Evaluation and Ongoing Maintenance

Hazard evaluation helps ensure the selection of the safest and most cost-effective hazard control strategy for each situation.

Chapter 5, *Risk Assessment and Reevaluation*, provides detailed guidance on how risk assessments are to be conducted in various categories of housing, including protocols for environmental sample collection and interpretation, evaluation of building and paint condition, and methods for sampling a subset of units in multi-family buildings.

Chapter 6, *Ongoing Lead-Safe Maintenance*, provides detail on how to properly manage remaining lead-based painted components and soil with elevated levels of lead into the future while minimizing risk. This chapter incorporates much of the contents of Chapter 17, *Routine Building Maintenance and Lead-Based Paint*, of the first edition of these *Guidelines*.

Chapter 7, *Lead-Based Paint Inspection*, provides detailed information on methods for testing housing to determine the presence of lead-based paint on a surface-by-surface basis, including the use of portable XRF analyzers and paint-chip sampling for laboratory analysis.

3. Chapters 8-10: Preparation for the Project

The critical steps in preparing to control lead-based paint hazards are covered in Chapters 8-10.

Chapter 8, *Resident Protection and Worksite Preparation*, provides guidance on the steps needed to ensure that occupants are not endangered and that contamination is not spread.

Chapter 9, *Worker Protection*, provides detailed advice on how to comply with the OSHA Lead in Construction Standard while performing work in housing.

Chapter 10, *Housing Waste*, provides practical advice on methods for handling and disposing various kinds of debris to protect the environment.

4. Chapters 11-15: Hazard Control, Cleanup, and Clearance

Detailed information on how to carry out all aspects of lead hazard control is provided in Chapters 11-15.

Chapter 11, *Interim Controls*, provides specific guidance on interim controls: general principles of interim controls; dust removal; paint film stabilization; friction surface treatments; and soil and exterior dust treatments. The chapter also incorporates some of the contents of Chapter 17 of the first edition of these *Guidelines*.

Chapter 12, *Abatement*, covers general principles of abatement such as component replacement, enclosure, paint removal methods, and soil abatement.

Chapter 13, *Encapsulation*, describes how to use encapsulants.

Chapter 14, *Cleaning Following Hazard Controls or other Paint-Disturbing Work*, details cleanup procedures for lead hazard control projects.

Chapter 15, *Clearance*, explains how to conduct clearance tests after a lead hazard control project to ensure that a unit or area is safe for reoccupancy.

5. Chapters 16-18: Related Issues

Information on addressing lead-based paint hazards in special situations is provided in the final chapters of these *Guidelines*.

Chapter 16, *Investigation and Treatment of Dwellings that House Children with Elevated Blood Lead Levels*, describes the special measures that are usually taken by health departments, property owners and others to investigate and treat environmental lead hazards once a child has been identified as having an elevated blood lead level.

The substance of **Chapter 17, *Routine Building Maintenance and Lead-Based Paint***, was incorporated into the revised Chapters 6 and 11. Chapter 17 is now reserved for potential future use.

Chapter 18, *Historic Preservation*, discusses the special situations and issues surrounding lead-based paint in historic dwellings.

6. Glossary and Appendices

The definitions of key terms are consolidated in the glossary and deserve special attention because the meanings of several key terms, such as “abatement” and “renovation,” differ from common usage. The appendices provide detailed background information and technical materials.

B. Units of Measurement

- ◆ **mg/cm²** – milligrams per square centimeter, used for paint.
- ◆ **mg/L** – milligrams per liter, used for water.
- ◆ **percent** – percent by weight, primarily used for paint (1 percent = 10,000 µg/g).
- ◆ **ppb** – parts per billion by weight (1,000 ppb = 1 ppm); primarily used for water.
- ◆ **ppm** – parts per million by weight (10,000 ppm = 1 percent), equivalent to µg/g; primarily used for paint and soil.
- ◆ **µg/dL** – micrograms per deciliter, used for blood.
- ◆ **µg/ft²** – micrograms per square foot, used for settled dust.
- ◆ **µg/g** – micrograms per gram of sample, equivalent to ppm by weight; primarily used for paint and soil.
- ◆ **µg/m³** – micrograms per cubic meter, used for air.

C. Federal Lead Standards

If Federal standards differ from State, Tribal or local standards, the most stringent (protective) standards must be applied.

- ◆ Lead-based paint – 24 CFR 35.110 and 40 CFR 745.103
1 mg/cm² or 5,000 µg/g (5,000 ppm, equal to 0.5 percent).
- ◆ Paint containing lead applied between 1978 and August 13, 2009
0.06 percent (600 ppm) by weight.
- ◆ Paint containing lead applied on or after August 14, 2009 – 16 CFR 1303.2
0.009 percent (90 ppm) by weight.
- ◆ Dust lead hazard levels (by wipe sampling) – 40 CFR 745.65(b)
40 µg/ft² – floors (carpeted and uncarpeted).
250 µg/ft² – interior windowsills.
- ◆ Dust lead levels for lead hazard screen only (by wipe sampling) – 24 CFR 35.1320(b)(2)(i)
25 µg/ft² – floors.
125 µg/ft² – interior windowsills.
- ◆ Dust lead clearance levels (by wipe sampling) – 40 CFR 745.227(e)(8)(viii)
40 µg/ft² – floors (includes carpeted and uncarpeted interior floors).
250 µg/ft² – interior windowsills.
400 µg/ft² – window troughs (previously called “window wells” in some literature).
- ◆ Bare residential soil hazard levels – 40 CFR 745.65(c)
400 µg/g – play areas used by young children.
1,200 µg/g – building perimeter (dripline or foundation area) and yard other than play areas.
- ◆ Airborne lead particulate – Occupational Exposure Criteria
30 µg/m³ – OSHA action level (8-hour time-weighted average) – 29 CFR 1926.62(b)
50 µg/m³ – OSHA permissible exposure limit (8-hour time-weighted average) – 29 CFR 1926.62(c)(1)
- ◆ National Primary and Secondary Ambient Air Quality Standard for Lead – 40 CFR 50.16(a)
0.15 µg/m³ – arithmetic mean concentration averaged over a 3-month period.
- ◆ Lead action level for drinking water systems – 40 CFR 141.80(c)(1)
15 ppb (0.015 mg/L) – Exceeded if lead is above this concentration in over 10% of a drinking water system’s tap water samples.

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Glossary

Notes:

- ◆ These definitions are for use within the scope of these *Guidelines*, that is, for lead-based paint hazard evaluation and control, and are not necessarily generic definitions applicable outside of this scope.
- ◆ For Federal regulatory definitions, please see:
 - CPSC’s Lead-Containing Paint regulation (16 CFR 1303);
 - EPA’s Lead-Based Paint Abatement; Renovation, Repair and Painting; and Pre-Renovation Education regulations (40 CFR Part 745);
 - HUD’s Lead Disclosure Rule and Lead Safe Housing Rule (24 CFR Part 35); and
 - OSHA’s Lead in Construction standard (29 CFR 1926.62).

AAALA: American Association for Laboratory Accreditation. Also known as **A2LA**.

Abatement: A measure or set of measures designed to permanently eliminate lead-based paint hazards or lead-based paint. Abatement strategies include the removal of lead-based paint, enclosure, encapsulation, replacement of building components coated with lead-based paint, removal of lead-contaminated dust, and removal of lead-contaminated soil or overlaying of soil with a durable covering such as asphalt (grass and sod are considered interim control measures). All of these strategies require preparation; cleanup; waste disposal; post-abatement clearance testing; recordkeeping; and, if applicable, monitoring. (For full EPA definition, see 40 CFR 745.223). See, also, **Interim controls**.

Abrasion resistance: Resistance of the paint to wear by rubbing or friction; related to both toughness and gloss.

Accreditation: A formal recognition that an organization, such as a training provider, is competent to carry out specific tasks or types of tests.

Accredited training provider: A training provider who meets the standards established by EPA (or an EPA-authorized State or Tribe) for the training of risk assessors, inspectors, abatement supervisors, abatement workers, renovators, and dust sampling technicians.

Accuracy: The degree of agreement between an observed value and an accepted reference value (a “true” value); a data quality indicator. Accuracy includes a combination of random errors (precision) and systematic errors (bias) due to sampling and analysis. See also the related, but different, term **Precision**.

Acrylic: A synthetic resin used in high performance waterborne coatings; a coating whose binder contains acrylic resins.

Adhesion: The ability of dry paint or other coating to attach to a surface and remain fixed on it without blistering, flaking, cracking, or being susceptible to removal by tape.

Administrative removal: The temporary removal of workers from the job to prevent the concentration of lead in their blood from reaching levels requiring medical removal.

AIHA: American Industrial Hygiene Association.

ALC: see **Apparent Lead Concentration**.

Aliquot: see **Subsample**.

Alkali: A chemical, such as lye, soda, lime, etc., that will neutralize an acid. Oil paint films can be destroyed by alkalis. Some paint removal products contain alkaline substances.

Alkyd: Synthetic resin modified with oil; coating that contains alkyd resins in the binder.

Apparent Lead Concentration (ALC): The x-ray fluorescence (XRF) reading or average of more than one reading on a painted surface. See also **XRF analyzer**, **Substrate Equivalent Lead (SEL)**, and **Corrected Lead Concentration (CLC)**.

Arithmetic mean: Average.

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

Bias: A systematic error in the measurement process. For XRF readings, one source of bias is the substrate effect. See also **Substrate effect** and **XRF analyzer**.

Binder: Solid ingredients in a coating that hold the pigment particles in suspension and bind them to the substrate. Binders used in paints and coatings include oil, alkyd, acrylic, latex, and epoxy. The nature and amount of binder determines many of the coating's performance properties – wash ability, toughness, adhesion, gloss, etc. See, also, **Pigment**.

Biological monitoring: The analysis of blood, urine, or both to determine the level of lead contamination in the body. Blood lead levels are expressed in micrograms of lead per deciliter (one-tenth of a liter) of blood, or $\mu\text{g}/\text{dL}$. They are also expressed in micromoles per liter ($\mu\text{mol}/\text{L}$).

Blank: An unexposed sample of the medium being used for testing (i.e., wipe or filter) that is analyzed to determine if the medium has been contaminated with lead (e.g., at the factory or during transport).

Blind sample: A sample submitted for analysis that has a known composition and identity that is not known to the analyst; used to test the analyst's or laboratory's proficiency in conducting measurements. See, also, the related term **Spiked sample**.

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

Building component replacement: see **Replacement**.

Cementitious material: A material that is mixed with water, either with or without aggregate, to provide the plasticity, cohesion, and adhesion necessary for the placement and formation of a rigid mass (ASTM Standard C 11).

Centimeter: see **cm**.

Certification: The process of testing and evaluating against certain specifications the competence of a person, organization, or other entity in performing a function or service, usually for a specified period of time.

Certified: The designation for contractors who have completed training and other requirements to allow them to safely undertake risk assessments, inspections, abatement or renovation. Risk assessors, inspectors, abatement contractors and renovation contractors should be certified (and licensed, if applicable) by the appropriate local, State or Federal agency.

Certified Industrial Hygienist (CIH): A person who has passed the 2-day certification exam of the American Board of Industrial Hygiene, and who has at least 4 years of experience in industrial hygiene and a graduate degree or a total of 5 years of experience. See, also, **Industrial hygienist**.

Certified reference material (CRM): Reference material that has at least one of its property values established by a technically valid procedure and is accompanied by or traceable to a certificate or other documentation issued by a certifying body. See, also, **Standard reference material**.

Certified Renovator: An individual who has successfully completed a renovator course accredited by EPA or an EPA-authorized State or Tribal program.

CFR: see **Code of Federal Regulations**.

Chalking: The photo-oxidation of paint binders - usually due to weathering - that causes a powder to form on the film surface.

Chewable surface: An interior or exterior surface painted with lead-based paint that a young child can mouth or chew. A chewable surface is the same as an “accessible surface” as defined in 42 U.S.C. 4851b(2). Hard metal substrates and other materials that cannot be dented by the bite of a young child are not considered chewable.

Chewed surface: Any painted surface that shows evidence of having been chewed or mouthed by a young child. A chewed surface is usually a protruding, horizontal part of a building, such as an interior windowsill. See, also, **Chewable surface**.

CLC: see **Corrected Lead Concentration (CLC)**

Cleaning: The process of using a vacuum and wet cleaning agents to remove leaded dust; the process includes the removal of bulk debris from the work area.

Cleaning Verification: The procedure required by EPA under its Renovation, Repair and Painting regulation after most renovations that disturb known or presumed lead-based paint. A certified renovator must perform a visual inspection to determine whether dust, debris or residue is still present. If so, these must be removed by re-cleaning and another visual inspection must be performed. After a successful visual inspection, the certified renovator must verify that each windowsill, uncarpeted floor and countertop in the work area has been adequately cleaned by wiping them with wet disposable cleaning cloths that are damp to the touch. If a cloth matches or is lighter than an EPA cleaning verification card, the surface passes; if not, it has to be re-cleaned and reverified. For more details, see Appendix 6 and 40 CFR 745.85(b).

Clearance examination: Visual examination and collection of lead dust samples by an inspector or risk assessor, or, in some circumstances, a sampling technician, and analysis by a EPA-recognized laboratory upon completion of an abatement project, interim control intervention, maintenance or renovation job that disturbs lead-based paint (or paint presumed to be lead-based.) For abatement projects, the clearance examination is performed to ensure that lead exposure levels do not exceed clearance standards established by the EPA at 40 CFR 745.227(e)(8)(viii); HUD’s dust-lead standards for clearance after interim control projects are found at 24 CFR 35.1320(b)(2)(i).

Clearance examiner: A person who conducts clearance examinations following lead-based paint hazard control and cleanup work, usually a certified risk assessor, certified inspector or sampling technician.

cm: Centimeter; 1/100 of a meter.

Code of Federal Regulations (CFR): The codification of the regulations of Federal agencies. The regulations are published in the *Federal Register*. See, also, *Federal Register (FR)*.

Cohesion: Ability of a substance to adhere to itself; internal adhesion; the force holding a substance together.

Common area: A room or area that is accessible to residents of more than one dwelling unit (e.g., hallways or lobbies); in general, any area not kept locked.

Competent person: As defined in the OSHA Lead Construction Standard (29 CFR 1926.62), a person who is capable of identifying or predicting hazardous working conditions and work areas, and who has authorization to take prompt, corrective measures to eliminate the hazards. A competent person may also be a risk assessor, inspector, abatement project supervisor or certified renovator; however, certification on its own does not give a person the authority to take corrective action, which a competent person must have.

Compliance plan: A document that describes the types of tasks, workers, protective measures, and tools and other materials that may be employed in lead-based paint hazard control to comply with the OSHA Lead Exposure in Construction standard.

Composite sample: A single sample made up of individual subsamples. Analysis of a composite sample produces the arithmetic mean of all subsamples.

Construction and Demolition Landfill (C&D): Landfills that only accept waste from construction and demolition activities. Some states and local governments permit residential LBP waste to be accepted as well.

Containment: A process to protect workers and the environment by controlling exposures to the lead-contaminated dust and debris created during abatement, interim controls or lead-safe renovation. See, also, **Worksite preparation level**.

Contingency plan: A document that describes an organized, planned, and coordinated course of action to be taken during any event that threatens human health or the environment, such as a fire, explosion, or the release of hazardous waste or its constituents from a treatment, storage, or disposal facility.

Corrected Lead Concentration (CLC): The absolute difference between the Apparent Lead Concentration and the Substrate Equivalent Lead. See, also, **Apparent Lead Concentration (ALC)** and **Substrate Equivalent Lead (SEL)**.

Deciliter (dL): one tenth of a liter.

Detection limit: The minimum amount of a substance that can be reliably measured by a particular method.

Deteriorated paint: Any paint coating on a damaged or deteriorated surface or fixture, or any interior or exterior lead-based paint that is peeling, chipping, blistering, flaking, worn, chalking, alligating, cracking, or otherwise becoming separated from the substrate.

Digestion blank: A mixture of the reagents used for digesting of paint, soil, or dust matrixes but without the matrix. The blank undergoes all the steps of the analysis, starting with digestion. The blank is used to evaluate the contamination process from a laboratory.

Direct-reading XRF: An analyzer that provides the operator with a display of lead concentrations calculated from the lead K shell X ray intensity without a graphic of the spectrum usually in mg/cm² (milligrams of lead per square centimeter of painted surface area). See, also, **XRF analyzer**.

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

Disposal facility: A facility or part of one in which waste is placed on land or in water to remain there after the facility closes.

Doormat: see **Walkoff mat**.

Dripline/foundation area: The area within 3 feet out from the building wall and surrounding the perimeter of a building.

Dust-lead hazard: Surface dust in residences that contains an area or mass concentration of lead equal to or in excess of the standard established by the EPA under Title IV of the Toxic Substances Control Act. EPA standards for dust-lead hazards, which are based on wipe samples, are published at 40 CFR 745.65(b); as of the publication of this edition of these *Guidelines*, these are 40 µg/ft² on floors and 250 µg/ft² on interior windowsills. (As of the publication of this edition of these *Guidelines*, in response to a petition received by the EPA on August 10, 2009, HUD and EPA are collaboratively considering whether to lower the dust-lead hazard thresholds.) Also called **Lead-contaminated dust**.

Notes:

- ◆ These *Guidelines*' related recommended standards for lead hazard screens, for which fewer samples are taken than in a risk assessment, are 25 µg/ft² for floors, and 125 µg/ft² for interior windowsills; if the results equal or exceed these levels, these *Guidelines* recommend that a full risk assessment be performed to determine if and where lead-based paint hazards truly exist). (See Chapter 5, especially Section II.I and V.D.)
- ◆ The EPA's related standards for clearance are 40 µg/ft² on floors, 250 µg/ft² on interior windowsills and 400 µg/ft² on window troughs. (40 CFR 745.227(e)(8) (viii))

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

Dust trap: A surface, component, or furnishing that serves as a reservoir where dust can accumulate.

EBL: Elevated blood lead level as defined by the Centers for Disease Control and Prevention. Local standards may differ. In 2012, the CDC revised its definition to use a "reference value" of the blood lead level at the 97.5th percentile of children aged 1 to 5 years old based on its National Health and Nutrition Examination Survey (NHANES). As of the publication of this edition of these *Guidelines*, the reference level was 5 µg/dL.

EIBLL child: see **Environmental Intervention Blood-Lead Level (EIBLL) child**.

Efflorescence: The salt rising to the surface of a material, such as masonry, plaster, or cement, caused by the movement of water through the material. Paint or encapsulants may not adhere to a surface contaminated with efflorescence.

Elastomeric: A group of pliable, elastic liquid encapsulant coatings. An elastomer is a macromolecular material that, at room temperature, is capable of substantially recovering its size and shape after the force causing its deformation is removed (see ASTM D907, D14).

Environmental Intervention Blood-Lead Level (EIBLL): As defined by HUD in the Lead Safe Housing Rule (24 CFR 35.110) as of the publication of this edition of these *Guidelines*, a blood lead level of a child under age 6 years at or above 20 µg/dL in a single test or at 15-19 µg/dL in two tests taken at least three months apart (). While the term and its definition were based on guidance from the Centers for Disease Control and Prevention, in 2012 CDC revised its guidance, and it is anticipated that those laws and regulations will be reconsidered at some point. See Chapter 16.

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

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

Engineering controls: Measures other than respiratory and other personal protection or administrative controls that are implemented at the worksite to contain, control, and/or otherwise reduce exposure to lead-contaminated dust and debris usually in the occupational health setting. The measures include process and product substitution, isolation, and ventilation. The term may be used in the occupational health setting in regard to preventing workers' exposures to lead; it can also be used in other lead hazard control settings, such as in regard to preventing residents' exposure.

Evaluation: Risk assessment, paint inspection, reevaluation, paint testing, environmental investigation, clearance examination, or risk assessment screen.

Examination: see **Clearance examination**.

Exposure assessment: The employer's sampling and analysis of the air workers breathe to determine the degree of worker exposure to lead by workers in each job classification in each work area. This involves air sampling inside the monitored workers' breathing zones, and comparison of the results to the OSHA Action Level and Permissible Exposure Limit for lead.

Exterior work area: For lead hazard control work, the exterior work area includes any exterior building components, such as roofs, exterior walls, the exterior portions of windows and doors, exterior stairways, fences, and unenclosed porches and patios; the safety perimeter; and access barriers, where work is being done, and the pathways and storage areas used to access those components.

Facility (pertaining to hazardous waste): All buildings, contiguous land, structures, and other appurtenances, as well as any improvements, where lead-based paint or hazardous waste is treated, stored, or disposed. A facility may consist of several different treatment, storage, or disposal units, such as landfills and surface impoundments.

Federal Register (FR): A daily Federal publication that contains proposed and final regulations, rules, and notices.

Field blank: A clean sample of the matrix (e.g., filter, or wipe) that has been exposed to the sampling conditions; returned to the laboratory; and analyzed as an environmental sample. Clean quartz sand, air sampling filters and cassettes, and clean wipes can be used as field blanks. The field blank, which should be treated just like the sample, indicates possible sources of contamination.

FR: see (FR).

Friction surface: Any interior or exterior surface, such as a window or stair tread, subject to abrasion or friction.

Garden area: An area where plants are cultivated for human consumption or for decorative purposes.

Geometric mean: A type of mean or average, which indicates the central tendency or typical value of a set of numbers. It is similar to the arithmetic mean, for which the numbers are added and then one n^{th} (where n is the count of numbers in the set) is found by division, except that, for the geometric mean, the numbers are multiplied and then the n^{th} root (where n is the count of numbers in the set) of the product is taken. For example, for the values 2, 2 and 16, the arithmetic mean is $(2 + 2 + 16) / 3 = 20/3 = 6.6666+$, and the geometric mean is $(2 * 2 * 16)^{1/3} = 64^{1/3} = 4$.

Heat gun: A device capable of heating lead-based paint causing it to separate from the substrate. For lead hazard control work, the heat stream leaving the gun should not exceed 1100°F (some authorities may use a different temperature).

HEPA filter: see **High Efficiency Particulate Air (HEPA) filter**.

High Efficiency Particulate Air (HEPA) filter: A filter capable of removing particles of 0.3 microns or larger from air at 99.97 percent or greater efficiency.

HEPA vacuum: A vacuum cleaner which has been designed with a HEPA filter as the last filtration stage. The vacuum cleaner must be designed so that all the air drawn into the machine is expelled through the HEPA filter with none of the air leaking past it. (Note that HUD's definition in its Lead Safe Housing Rule, with its slightly different wording, is substantively identical.)

Household hazardous waste: Household waste is regular garbage or trash that is disposed of as municipal waste, and managed according to state and local requirements. Waste generated in residential setting. EPA has determined that residents and contractors working in residences are entitled to manage their own LBP waste in this manner.

Impact surface: An interior or exterior surface (such as surfaces on doors) subject to damage by repeated impact or contact.

Incinerator: An enclosed device using controlled flame combustion that neither meets the criteria for classification as a boiler nor is listed as an industrial furnace.

Indian Housing Agency: An agency within an Indian tribal government that receives grants and provides assistance (under the United States Housing Act of 1937) for affordable housing activities for Indians.

Industrial hygienist: A person having a college or university degree in engineering, chemistry, physics, medicine, or a related physical or biological science who, by virtue of special training, is qualified to anticipate, recognize, evaluate, and control environmental and occupational health hazards and the impact of those hazards on the community and workers.

In-place management: see **Interim controls**.

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

Inspector (more formally, Lead-Based Paint Inspector): An individual who has successfully completed training from an accredited program and been licensed or certified by the appropriate State or local agency to:

- (1) perform inspections to determine and report the presence of lead-based paint on a surface-by-surface basis through on-site testing;
- (2) report the findings of such an inspection;
- (3) collect environmental samples for laboratory analysis;
- (4) perform clearance testing; and optionally
- (5) document successful compliance with lead-based paint hazard control requirements or standards.

Interim controls: A set of measures designed to temporarily reduce human exposure or possible exposure to lead-based paint hazards. Such measures include, but are not limited to, specialized cleaning, repairs, maintenance, painting, temporary containment, and the establishment and operation of management and resident education programs. Monitoring, conducted by owners, and reevaluations, conducted by professionals, are integral elements of interim control. Interim controls include dust removal; paint film stabilization; treatment of friction and impact surfaces; installation of soil coverings, such as grass or sod; and land use controls. Interim controls that disturb painted surfaces are renovation activities under EPA's Renovation, Repair and Painting Rule. See, also, **Monitoring, Reevaluation, and Abatement**.

Interior windowsill: The portion of the horizontal window ledge that protrudes into the interior of the room, adjacent to the window sash when the window is closed; often called the window stool.

Investigation (pertaining to EIBLL cases only): The process of determining the source of lead exposure for a child or other resident with an elevated blood lead level. Investigation consists of administration of a questionnaire, comprehensive environmental sampling, case management, and other measures.

Investigator: A person who conducts an investigation of a dwelling where a resident has an environmental intervention blood lead level. The investigator must be proficient in interviewing techniques, environmental sampling, and the interpretation of risk assessment and environmental sampling data.

Laboratory analysis: A determination of a sample by a qualified laboratory using a defined method meeting specified performance and quality criteria. In the case of analysis of samples of lead in paint, dust or soil in target housing or pre-1978 child-occupied facilities, the laboratory must be recognized by NLLAP. Among the methods used by these laboratories for determining lead content are atomic absorption spectroscopy (AAS), inductively coupled plasma emission spectroscopy (ICP), or laboratory-based K or L X-ray fluorescence, or an equivalent method.

Landfill: A State licensed or State permitted disposal facility that meets municipal solid waste standards.

Latex: A waterborne emulsion paint made with synthetic binders, such as 100 percent acrylic, vinyl acrylic, terpolymer, or styrene acrylic; a stable emulsion of polymers and pigment in water.

LBP: Lead-based paint.

Lead: Lead includes metallic lead and inorganic and organic compounds of lead.

Lead-based paint: Any paint, varnish, shellac, or other coating that contains lead equal to or greater than 1.0 mg/cm² as measured by XRF or laboratory analysis, or 0.5 percent by weight (5000 mg/g, 5000 ppm, or 5000 mg/kg) as measured by laboratory analysis. (Local definitions may vary.) (As of the publication of this edition

of these *Guidelines*, in response to a petition received by the EPA on August 10, 2009, HUD and EPA are collaboratively considering whether to lower the threshold levels of lead-based paint.)

Lead-based paint abatement planner/designer: An individual who has completed an accredited training program on planning and designing lead-based paint hazard control projects.

Lead-based paint abatement worker: see **Worker**.

Lead-based paint free: A property where no lead in amounts greater than or equal to 1.0 mg/cm² in paint (or surface coatings) was found on any building components, using the inspection protocol in Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* (2012 Revision).

Notes:

- ◆ A lead-based paint-free property may contain lead incorporated into components that are not lead-based painted, such as ceramic tile, or painted components below the standard stated in this definition.
- ◆ Some states and localities have a lower threshold for the definition of lead-based paint.
- ◆ OSHA does not consider whether paint is lead-based paint in its regulations; its regulations focus on whether workers may be exposed to lead whatever the source.

Lead-based paint hazard: A condition in which exposure to lead from lead-contaminated dust, lead-contaminated soil, or deteriorated lead-based paint would have an adverse effect on human health (as established by the EPA at 40 CFR 745.65, under Title IV of the Toxic Substances Control Act). Lead-based paint hazards include, for example, **paint-lead hazards**, **dust-lead hazards**, and **soil-lead hazards**.

Lead-based paint hazard control: Activities intended to control and eliminate lead-based paint hazards, including but not limited to interim controls and abatement.

Lead-based paint inspector or **Lead paint inspector:** see **Inspector**.

Lead-based paint risk assessor: see **Risk Assessor**.

Lead carbonate: A pigment used in some lead-based paints as a hiding agent; also known as white lead.

Lead-contaminated dust: See **Dust-lead hazard**.

Lead-contaminated soil: See **Soil-lead hazard**.

Lead-containing paint: As defined by the Consumer Product Safety Commission, paint or other similar surface coating materials for consumer use that contain lead or lead compounds and in which the lead content (calculated as lead metal) is in excess of 0.009 percent by weight of the total nonvolatile content of the paint or the weight of the dried paint film (see 16 CFR 1303.1(c)).

Lead hazard screen: A method of determining, in buildings in good condition, whether they should have a full risk assessment. The screen uses fewer samples but more stringent evaluation criteria (standards) than regular risk assessments. Also called a **risk assessment screen**.

Lead-poisoned child: A child with an elevated blood level (see **EBL**).

Lead-specific detergent: A cleaning agent manufactured specifically for cleaning and removing leaded dust or other lead contamination.

Leaded dust: see **Lead-contaminated dust**.

Licensed: Holding a valid license or certification issued by EPA or by an EPA-authorized State or Tribal program pursuant to Title IV of the Toxic Substances Control Act. The license is based on certification for lead-based paint hazard evaluation or control work. See, also, **Certified**.

Maintenance: In the context of lead hazard control, work intended to maintain adequate living or occupancy conditions in target housing or a pre-1978 child-occupied facility; it may have the potential to disturb known or presumed lead-based paint.

Mat: See **Walkoff mat**.

Matrix blank: A sample of the matrix (paint chips, soil, or dust) that does not contain the analyte lead. This sample goes through the complete analysis, including digestion.

MDL: see **Method detection limit**.

Mean: The arithmetic average of a series of numerical data values; for example, the algebraic sum of the data values divided by the number of data values. Synonymous with **Arithmetic mean** and **Average**. See, also, the related term **Standard Deviation**.

Medical removal: The temporary removal of an employee from the job because the employee's blood lead level is at or above 50 µg/dL of the occurrence of an adult "elevated blood lead level" as defined in the OSHA Lead Exposure in Construction standard (29 CFR 1926.62(k)(1)(i)).

Method blank: see **Digestion blank**.

Method detection limit (MDL): The minimum concentration of an analyte that, for a given matrix and method, has a 99 percent probability of being identified, qualitatively or quantitatively measured, and reported to be greater than zero.

mg: Milligram; 1/1000 of a gram.

µg (or mcg): Microgram. The prefix micro means 1/1,000,000 (or one-millionth); a microgram is 1/1,000,000 of a gram and 1/1000 of a milligram; equal to about 35/1,000,000,000 (35 billionths) of an ounce (an ounce is equal to 28,400,000 mg).

Microgram: see **µg**.

Mil: 1/1000 of an inch; used to measure thickness.

Milligram: see **mg**.

Monitoring: An organized program of regular surveillance to determine that:

- (1) known or presumed lead-based paint is not deteriorating;
- (2) lead-based paint hazard controls, such as paint stabilization, interim control measures for soil, enclosure, or encapsulation have not failed;
- (3) structural problems do not threaten the integrity of hazard controls or of known or presumed lead-based paint, and
- (4) dust lead levels have not risen above applicable standards.

There are two types of monitoring activities: visual surveys by property owners and reevaluations by certified risk assessors. Visual surveys are generally conducted annually and at rental housing unit turn-over for the purpose of making the first three determinations listed above. Monitoring is not required in properties known to be free of lead-based paint. See also **Reevaluation**.

Note: Worker exposures must be monitored for lead; this is a different sense of “monitoring” than the facility and operational monitoring discussed above. See **Exposure Assessment**, Chapter 9 and Appendix 6.

Mouthable surface: see **Chewable surface**.

Multifamily housing: Housing that contains more than one dwelling unit per location. HUD, the U.S. Department of Agriculture, and other agencies’ programs may use a larger number of units, such as five or ten, to differentiate single family housing from multifamily housing in their regulations.

NLLAP requirements: Requirements specified by the EPA National Lead Laboratory Accreditation Program (NLLAP), for accreditation for the lead analysis of paint, soil, and dust matrixes by an EPA-recognized laboratory accreditation organization.

Offsite paint removal: The process of removing a component from a building and stripping the paint from the component at a paint stripping facility away from the building’s property.

Ongoing monitoring: see **Monitoring**.

Owner: A person, firm, corporation, guardian, conservator, receiver, trustee, executor, government agency or entity, or other judicial officer who, alone or with others, owns, holds, or controls the freehold or leasehold title or part of the title to property, with or without actually possessing it. This definition includes a vendee who possesses the title, but does not include a mortgagee or an owner of a reversionary interest under a ground rent lease.

Oxidation: An example of a chemical reaction that occurs upon exposure to oxygen and other oxidizing substances. Some coatings cure by oxidation; oxygen enters the liquid coating and cross links (attaches) the resin molecules. This film-forming method is also called “air cure” or “air dry.” Oxidation also causes rust to form on metals and paint to chalk.

Paint-lead hazard:

Lead-based paint on a friction surface that is subject to abrasion and where a dust-lead hazard is present on the nearest horizontal surface underneath the friction surface (e.g., the window sill, or floor);

Damaged or otherwise deteriorated lead-based paint on an impact surface that is caused by impact from a related building component;

A chewable lead-based painted surface on which there is evidence of teeth marks; or

Any other deteriorated lead-based paint in any residential building or child-occupied facility or on the exterior of any residential building or child-occupied facility.

Paint stabilization: The process of wet scraping, priming, and repainting surfaces coated with deteriorated lead-based paint. Paint stabilization also includes eliminating the cause(s) of paint deterioration, cleanup and clearance.

Paint removal: The removal of lead-based paint from surfaces; this may be an abatement strategy, or it may occur as a part of a renovation project.

Patch test: A test method or procedure to assess the adhesion of an encapsulant coating to a substrate covered with a layer or layers of lead-based paint.

Personal breathing zone samples: Air samples collected from the breathing zone of a worker (within a 1 foot radius of the worker's mouth) but outside the respirator. With respect to assessing lead exposures, the samples are collected with a personal sampling pump operating at 2 liters per minute, drawing air through a 37 mm mixed cellulose ester filter housed in a closed-face cassette with a pore size of 0.8 micrometers. See **Exposure assessment**.

Personal Protective Equipment (PPE): Equipment for protecting the eyes, face, head, and/or extremities; includes protective clothing, respiratory devices, and protective shields; used when hazards capable of causing bodily injury or impairment are encountered.

PHA: see **Public Housing Agency (PHA)**.

Pigment: Insoluble, finely ground materials that give paint its properties of color and hide.

Plastic: see **Polyethylene plastic**.

Play area: An area of frequent soil contact by children of under age 6 as indicated by, but not limited to, such factors including the following: the presence of outdoor play equipment (e.g., sandboxes, swing sets, and sliding boards), toys, or other children's possessions, observations of play patterns, or information provided by parents, residents, care givers, or property owners.

Polyethylene plastic: Polyethylene plastic or any other thick plastic material shown to demonstrate at least equivalent performance in containing dust and waste, resist tearing, and, after being properly sealed, remain leak tight with no visible signs of discharge during movement or relocation.

Polyurethane: An exceptionally hard and wear-resistant coating created by the reaction of polyols with a multifunctional isocyanate; often used to seal wood floors following lead-based paint hazard control work and cleaning.

Precision: The degree to which a set of observations or measurements of the same property, usually obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed in either absolute or relative terms as standard deviation, variance, or range. Often known as "reproducibility." See also the related, but different, term **Accuracy**.

Primary prevention: The process of preventing lead hazards from occurring and, when they do occur, controlling lead hazards to prevent exposure *before* a child is poisoned. See, also, **Secondary prevention** and **Tertiary prevention**.

Primary standard: A substance or device with a property or value that is unquestionably accepted, within specified limits, in establishing the value of the same or related property of another substance or device.

Public Housing Agency (PHA): Any State, county, municipality, or other government entity or public body, or agency or instrumentality thereof, authorized to engage or assist in the development or operation of housing for low-income families.

Quality Assurance (QA): An integrated system of activities involving planning, quality control, quality assessment, reporting, and quality improvement to ensure that a product or service meets defined standards of quality within a stated level of confidence.

Quality Control (QC): The overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users. The aim is to provide a level of quality that is satisfactory, adequate, dependable, and economical.

Random sample: A sample drawn from a population in a way that allows each member of the population to have an equal chance of being selected. Random sampling is a process used to identify locations for the lead-based paint inspections in multifamily dwellings. See, also, **Targeted sample** and **Worst-case sample**.

RCRA: see **Resource Conservation and Recovery Act (RCRA)**.

Recognized laboratory: A laboratory that has been evaluated by the EPA's National Lead Laboratory Accreditation Program (NLLAP), and has demonstrated the capability to accurately analyze paint chip, dust, or soil samples for lead; the recognition for analysis of lead in a particular medium is held for a specified period of time, subject to continued quality control testing under the NLLAP.

Reevaluation: The combination of a visual assessment and collection of dust and, as appropriate, soil samples performed by a certified risk assessor to determine if the housing is free of lead-based paint hazards, and determine whether previously implemented lead-based paint hazard control measures are still effective.

Reference material: A material or substance that has at least one sufficiently well established property that can be used to calibrate an apparatus, assess a measurement method, or assign values to materials.

Removal: see **Paint removal**.

Renovation: According to EPA, the modification of any existing structure, or a portion of it, that results in the disturbance of painted surfaces, unless it is performed as part of an abatement or is a minor repair and maintenance activity, as these terms are defined by 40 CFR 745.223 and 745.83, respectively; see Appendix 6. The term renovation includes (but is not limited to): The removal, modification or repair of painted surfaces or painted components (e.g., modification of painted doors, surface restoration, window repair, surface preparation activity (such as sanding, scraping, or other such activities that may generate paint dust)); the removal of building components (e.g., walls, ceilings, plumbing, windows); weatherization projects (e.g., cutting holes in painted surfaces to install blown-in insulation or to gain access to attics, planing thresholds to install weather-stripping), and interim controls that disturb painted surfaces. A renovation performed for the purpose of converting a building, or part of a building, into target housing or a child-occupied facility is a renovation under this subpart.

Renovator: An individual who either performs or directs workers who perform renovations. Under EPA's Renovation, Repair, and Painting (RRP) Rule, a **Certified Renovator**.

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

Reporting Limit: This value describes what a laboratory has determined as the lowest lead value it can report with sufficient confidence (such as 95% confidence) for the amount of the analyte (e.g., lead) in the matrix of interest (e.g., paint, dust, or soil).

Representative sample: A sample of a universe or whole (e.g., bare soil sample, waste sample pile, groundwater, or waste stream) that can be expected to exhibit the average properties of the entire universe or whole.

Resident: A person who regularly lives in a dwelling. A person who is not regularly living in the dwelling unit but is present when lead hazard control work is being done is an occupant of the dwelling who deserves the same level of protection as the residents of the dwelling.

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

Risk assessment: An on-site investigation of a residential dwelling to determine the existence, nature, severity, and location of lead-based paint hazards. Risk assessments, which must be conducted by a certified risk assessor, include an investigation of the age, history, management, and maintenance of the dwelling, and the number of children under age 6 and women of childbearing age who are residents; a visual assessment; limited randomized environmental sampling (i.e., collection of dust wipe samples, soil samples, and deteriorated paint samples); and preparation of a report identifying abatement and interim control options based on specific conditions. HUD's Lead Safe Housing Rule requires risk assessments for certain types and amounts of HUD assistance; in these cases, a risk assessment must be no more than 12 months old to be considered current.

Risk assessment screen: See **Lead hazard screen**.

Risk assessor: A certified individual who has successfully completed lead-based paint hazard risk assessment training with an accredited training program and who has been certified to:

- (1) perform risk assessments;
- (2) identify acceptable abatement and interim control strategies for reducing identified lead-based paint hazards;
- (3) perform clearance testing and reevaluations; and
- (4) document the successful completion of lead-based paint hazard control activities.

RL: see **Reporting Limit (RL)**

Room Equivalent: A room equivalent is an identifiable part of a residence (e.g., room, house exterior, foyer, etc.).

Sample site: A specific spot on a surface being tested for lead loading or concentration.

Sampling Technician: A person who has completed a EPA-accredited or EPA-authorized State-accredited training course for sampling technicians and is qualified to perform clearance examinations after certain interim control activities. (Previously known as a clearance technician.)

Saponification: The chemical reaction between alkalis and oil that produces a type of soap. Because of saponification, oil and alkyd coatings will not adhere to masonry substrates, galvanized metals, or zinc-rich primers.

Screen: See **Lead hazard screen**.

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

Secondary prevention: The process of identifying children who have elevated blood lead levels, and controlling or eliminating the sources of further exposure. See, also, **Primary prevention** and **Tertiary prevention**.

Secondary standard: A reference material with a well-defined, high quality, traceability linkage to existing **primary standards** for the same measurements. **SEL:** see **Substrate Equivalent Lead (SEL)**.

Site: Regarding hazardous waste, the land or body of water where a facility is located or an activity is conducted. The site includes adjacent land used in connection with the facility or activity. (See Chapter 10.)

Small quantity generator: Owners, contractors (generators), or both who produce less than 100 kg of hazardous waste per month and accumulate less than 100 kg of hazardous waste at any one time, or who produce less than 1 kg of *acutely* hazardous waste per month and accumulate less than 1 kg of *acutely* hazardous waste at any one time. (See Chapter 10.)

Soil-lead hazard: Bare soil on residential property that contains lead in excess of the standard established by the EPA under Title IV of the Toxic Substances Control Act. EPA standards for soil-lead hazards, published at 40 CFR 745.65(c), as of the publication of this edition of these *Guidelines*, is 400 µg/g in play areas and 1,200 µg/g in the rest of the yard. Also called **Lead-contaminated soil**.

Spectrum analyzer: A type of XRF analyzer that provides the operator with a plot of the energy and intensity, or counts, of K shell and/or L shell X-ray spectra, as well as a calculated lead concentration. See, also, **XRF analyzer**.

Spiked matrix: See **Spiked sample**.

Spiked sample: A sample prepared by adding a known mass of the target analyte (e.g., lead, as in leaded dust) to a specific amount of matrix sample (e.g., a dust wipe) for which an independent estimate of the target analyte mass is available. Spiked samples are used to determine, for example, the effect of the matrix on a method's recovery efficiency. See, also, the related term **Blind sample**.

Spot prime: To apply a paint primer to localized areas of exposed substrate.

Standard deviation: A measure of the precision of a reading; the spread of the deviation from the mean. The smaller the standard deviation, the more precise the analysis. The standard deviation is calculated by first obtaining the mean, or the arithmetic average, of all of the readings. A formula is then used to calculate how much the individual values vary from the mean – the standard deviation is the square root of the arithmetic average of the squares of the deviation from the mean. Many hand calculators and computer spreadsheets have an automatic standard deviation function. See, also, **Mean**.

Standard reference material (SRM): A certified reference material produced by the National Institute of Standards and Technology (NIST at the U.S. Department of Commerce) and characterized for absolute content independent of analytical method. See, also, **Certified reference material**.

Subsample: A constituent portion of a sample. A subsample may be either a field subsample or a laboratory subsample, depending on where the subsample is created. A subsample may be combined with other subsamples to produce a composite sample. See, also, **Composite sample**.

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

Substrate effect: The radiation returned to an XRF analyzer by the paint, substrate, or underlying material, in addition to the radiation returned by any lead present. This radiation, when counted as lead X-rays by an XRF analyzer contributes to substrate equivalent lead (bias). The inspector may have to compensate for this effect when using XRF analyzers. See, also, **XRF analyzer**.

Substrate Equivalent Lead (SEL): The XRF measurement taken on an unpainted surface; used to calculate the corrected lead concentration on a surface by using the following formula: Apparent Lead Concentration - Substrate Equivalent Lead = Corrected Lead Concentration. See, also, **Apparent Lead Concentration (ALC)**, **Corrected Lead Concentration (CLC)**, and **XRF analyzer**.

Target housing: Any housing constructed before 1978 – except dwellings that do not contain bedrooms, or dwellings that are designated specifically for the elderly or persons with disabilities, unless a child younger than 6 resides or is expected to reside in the dwelling. In the case of jurisdictions that banned the sale or use of lead-based paint before 1978, the Secretary of HUD may designate an earlier date for defining target housing.

Targeted sample: A sample of dwelling units selected from an apartment building or housing development using information supplied by the owner, and not by random selection or on the basis of visual evidence obtained by the risk assessor. Based on the owner's information, the units are selected to have the greatest probability of containing lead-based paint hazards. See, also, **Worst-case sample** and **Random sample**.

TCLP: see **Toxicity Characteristic Leaching Procedure (TCLP)**.

Tribally-Designated Housing Entity: A designation by an Indian tribe's authority (i.e., tribal council or like body) of an entity other than the tribal government to receive grants and provide assistance under the Native American Housing Assistance and Self-Determination Act (P.L. 104-330 as amended) for affordable housing activities for Indians.

Tertiary prevention: Providing medical treatment to children with elevated blood lead levels to prevent more serious injury or death.

Testing combination: A unique surface to be tested that is characterized by the room equivalent, component, and substrate.

Test location: A specific area on a testing combination where XRF instruments will test for lead-based paint.

Toxicity Characteristic Leaching Procedure (TCLP): A laboratory test to determine if excessive levels of lead or other hazardous materials could leach from a sample into groundwater; usually used to determine if waste is hazardous based on its toxicity characteristics. (See Chapter 10.)

Trained: Successful completion of a training course in a particular discipline. For lead hazard evaluation or control work, the training course must be accredited by EPA or by an EPA-authorized State or tribal program, pursuant to Title IV of the Toxic Substances Control Act.

Treatment: A method designed to control lead-based paint hazards. Treatment includes interim controls, abatement, and removal.

Trisodium phosphate (TSP) detergent: A detergent that contains trisodium phosphate. These guidelines do not recommend using TSP.

Trough: see **Window trough**.

Truck-mounted vacuum unit: A vacuum system whose components, except for hoses and attachments, are located outside the building undergoing dust removal. The exhaust is vented outside so that the interior dust is not disturbed.

TSD: see **Treatment, Storage, and Disposal (TSD) facility**.

TSP: see **Trisodium phosphate (TSP) detergent**.

Useful life: The life expectancy of a coating before it requires refinishing or some other form of maintenance.

Vacuum/wet cleaning/vacuum cycle: The cleaning cycle that begins with HEPA vacuuming, followed by a wet cleaning with a detergent, followed by a final pass with a HEPA vacuum over the surface.

VOC: see **Volatile Organic Compound (VOC)**.

Volatile Organic Compound (VOC): Organic (carbon-based) substances that evaporate from a coating, such as during the coating or curing process.

Walkoff mat: A washable, fibrous material (preferably with a rubber or vinyl backing) positioned at an entryway to reduce transport of lead dust and/or lead soil into a building, or out of a work area.

White lead: A white pigment, usually lead carbonate. See, also, **Lead carbonate**.

Windowsill: see **Interior windowsill**.

Window stool: see **Interior windowsill**.

Window trough: For a typical double hung window, the portion of the exterior windowsill between the interior windowsill (or stool) and the frame of the storm window. If there is no storm window, the window trough is the area that receives both the upper and lower window sashes when they are both lowered. (Sometimes inaccurately called a window “well.”) See, also, **Window well**.

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

Worksite: Any interior or exterior area where lead-based paint hazard control work takes place. There may be more than one worksite in a dwelling unit or at a residential property.

Worksite preparation activities: A set of measures designed to protect residents and the environment from leaded dust, paint chips, or other forms of lead contamination through the erection of barriers and the establishment of access control, resident relocation or movement restrictions, warning signs, ventilation, engineering controls, and other measures.

Worst case sample: A sample of dwelling units having the greatest probability of containing lead-based paint hazards selected by a risk assessor on the basis of the risk assessor’s visual examination of all dwelling units in a housing development or apartment building. See, also, **Targeted sample** and **Random sample**.

XRF analyzer: An instrument that determines lead concentration in milligrams per square centimeter (mg/cm²) using the principle of X-ray fluorescence (XRF). Two types of XRF analyzers are used – direct readers and spectrum analyzers. In these *Guidelines*, the term XRF analyzer generally refers to portable instruments manufactured to analyze paint, and does not refer to laboratory grade units. Some portable instruments can be used to analyze lead in dust or soil.