



CHAPTER 3: BEFORE YOU BEGIN— PLANNING TO CONTROL LEAD HAZARDS

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Planning To Control Lead Hazards: How To Do It

1. Determine the most appropriate long-term or short-term evaluation and control response to the lead hazards for a specific property. Select the most opportune time to conduct lead hazard evaluation and control (often during unit turnover, remodeling or renovation work, refinancing, or substantial maintenance activity). Determine if historic preservation requirements apply to the property.
2. Decide whether Federal, State, or local regulations require specific lead hazard evaluation or control activities.
3. Determine the potential for the property to contain lead hazards. If the dwelling was built before 1978 or if a child with an elevated blood lead level is present (see Glossary for technical definition), a building-related lead hazard may exist. If the dwelling was built after 1978 and no history of lead poisoning is evident, there is very little chance that a lead hazard exists and no further action is required.
4. Consider whether to acquire the services of a risk assessor and/or an inspector technician to perform an evaluation. For large multifamily projects, develop and issue a Request for Proposals (RFP) for inspections and/or risk assessments. If a property owner decides to implement lead hazard controls without an evaluation, all painted, varnished, or other coated surfaces should be assumed to have lead-based paint.
5. Conduct an evaluation (i.e., a risk assessment, paint inspection, or a combination of the two). For properties in good condition, a lead hazard screen risk assessment is recommended to determine if a full risk assessment is necessary (see Chapter 5).
6. If lead hazards are identified or assumed to exist, select specific lead hazard control methods for specific building components. Include waste considerations, management, resident and worker protection, and cost in determining the best method for the property. Determine the methods and the person(s) responsible for obtaining any necessary permits. Obtain a cost estimate from a certified contractor or risk assessor. Cost estimation considerations are outlined in this chapter.
7. Develop specifications for lead hazard control work (usually for large multifamily projects).
8. Conduct pilot projects and revise specifications if necessary (for large multifamily projects only).
9. Schedule other related construction work to coordinate with lead hazard control work.
10. Select a lead hazard control contractor (this may precede the pilot project). Ensure that the contractor has adequate bonding (if required) and insurance.
11. Correct preexisting problems or conditions before beginning lead hazard control work.
12. Determine person(s) responsible for monitoring work to ensure safety (supervisor, risk assessor/consultant, owner).
13. Select the independent, certified inspector technician or risk assessor responsible for conducting clearance testing. Certified risk assessors should conduct the clearance testing if a hazard evaluation was not performed before work began.
14. Conduct lead abatement or interim control work, including cleanup and clearance testing.
15. Determine if Federal regulations or local jurisdictions require issuance of certificates following clearance.
16. Arrange for ongoing monitoring by the owner or owner's representative and an appropriate reevaluation schedule by a certified professional (see Chapter 6).



Chapter 3: Before You Begin— Planning To Control Lead Hazards

This chapter is designed to help plan lead hazard control efforts. It describes the process of evaluation and control and suggests items to consider in estimating costs and ensuring quality. Included are (1) methods for determining whether risk assessments or inspections are appropriate; (2) the typical phases of lead hazard control projects (both interim control and abatement); and (3) the key issues to be addressed at each phase.

I. Concept and Purpose

The goal of lead hazard evaluation and control is to correct lead hazards in the safest and most cost-effective manner feasible. In most cases this will require the expertise of licensed or certified professionals. The choices usually include inspection followed by abatement, risk assessment followed by interim controls, and/or abatement or lead hazard control without a risk assessment or inspection. However, this simple concept may not be applicable to all cases. Sometimes a tailored combination approach is best. In some cases risk assessments will result in abatement if interim controls are not feasible or advisable. A combination of abatement and interim control methods is sometimes most feasible for a particular dwelling. See the Glossary and Chapter 1 for definitions of risk assessment, inspection, interim controls, and abatement.

If it is reasonable to assume that all surfaces to be treated contain lead-based paint, all horizontal surfaces have lead-contaminated dust, and all bare soil is contaminated, it may be cost effective to proceed directly to lead hazard control procedures without any preliminary inspection or risk assessment. If there is no evaluation, the control activities should be followed by a risk assessment to ensure that all risks have been appropriately controlled. In this case, all clearance testing must be done by a certified risk assessor. This option is discussed further in Section IV below.

If all paint is intact, dust and bare soil lead levels are well below applicable standards, and no other hazards are present, any lead-based painted surface can be managed until an opportune time for abatement occurs (such as a planned renovation or dwelling turnover).

II. Determining Whether a Short-Term or Long-Term Response Is Appropriate

Completely eliminating the hazards from the housing environment through risk assessment/inspection followed by abatement is an effective and safe approach to lead hazard control, provided that:

- ◆ All types of lead hazards are addressed, including lead-contaminated dust and soil.
- ◆ Workers and residents are not adversely affected during the work.
- ◆ The process is properly controlled so that new lead hazards are not created.
- ◆ Cleanup is adequate as determined by clearance testing.

The inspection/abatement approach has the advantage of being a one-time intervention that, if done properly, can produce permanent results. However, for many owners, abatement may be unnecessary or too expensive and technically demanding, at least in the short run.

Until permanent abatement is feasible for these owners, identifying lead hazards by risk assessment and treating them by using interim control methods (and perhaps abating a few key surfaces) is an effective, short-term alternative. The risk assessment/interim control approach has the advantage of treating the lead hazards to which children are likely to be exposed, while temporarily controlling and monitoring the lead-based paint on an ongoing basis.



Some owners may decide to adopt a continuous interim control approach, which will require ongoing monitoring of paint hazards. Unless regulated by the local jurisdiction or applicable Federal or State funding program, owners can select whatever strategy they wish, as long as certain prohibited paint removal practices are not used (see Chapter 11) and compliance with clearance standards is achieved. This provides substantial flexibility for different types of housing and ownership patterns, permits innovation, and still ensures that dwellings are lead-safe (see the Glossary for the definition of a “lead-safe dwelling”).

To determine the measures that will be most effective and safe for a given property, certain planning steps are appropriate (see Table 3.1). These steps are generally the same for all types of properties, but for smaller buildings and especially single-family homes, some of the steps may not be appropriate, as indicated by asterisks in Table 3.1.

Regulatory requirements may predetermine the lead hazard control strategy as well as when lead hazard identification efforts are required. In a few States, including Maryland and Massachusetts, inspection and abatement of certain lead-based paint hazards (defined by each State) are mandated, under some circumstances, for rental properties. In many States inspection and abatement (to varying standards) are required when a lead-poisoned child is identified. If the dwelling is associated with a Federal program, HUD regulations for that specific program should be consulted. (HUD regulations vary considerably from one program to the next.)

III. Review of Existing Conditions and Preliminary Determination of Lead Hazard Control Strategy

The choice of a strategy depends on the extent of the lead hazards that exist and the financial resources available to address them. In addition, before undertaking risk assessment or inspection, certain existing conditions at a property

should be reviewed, since they may indicate which lead hazard control strategy is appropriate. The lack of historical evidence of lead poisoning in a particular area should not be considered conclusive when determining whether or not a population is at risk or whether a dwelling unit contains lead hazards. Although in many parts of the country there have historically been few reported cases of lead poisoning, it may be because very few children were tested regularly. With increased public awareness and more widespread blood lead testing, it is expected that many more children with lead poisoning will be identified. The following general issues should be reviewed:

- ◆ Condition of the property.
- ◆ Age of the property (including historic preservation requirements).
- ◆ Capital replacement plans for the property (or expected useful life).
- ◆ Ongoing management and maintenance issues.
- ◆ Existing occupants.
- ◆ Regulatory requirements.
- ◆ Financing resources.

Each of these considerations is described below.

A. Condition of the Property

The condition of painted building components should be a primary consideration in devising the overall lead hazard control strategy. If painted building components have deteriorated to the point where they are difficult to maintain, or if the dwelling unit is subject to recurring water infiltration or other water damage, neither interim controls nor abatement will be effective without a substantial restoration effort. Interim controls and some forms of abatement are likely to have very short lives in these situations.

B. Age of the Property

Age of the property can indicate the amount of lead-based paint likely to be present and the



extent of the lead hazard control work that may be necessary. The majority of buildings built before 1978, and especially those built before 1960, contain some lead-based paint (HUD, 1990b). The older the dwelling, the higher the concentration of lead in the paint. For pre-1950 properties, it is reasonable to assume that lead-based paint is present on more than a few surfaces and that abatement of lead hazards will involve a significant amount of work. Table 3.2 demonstrates the relationship between age and

prevalence of lead-based paint (HUD, 1990b). It is worth noting that there is tremendous variability in houses within each age group. Depending on local conditions, some pre-1950 dwellings may have no lead-based paint at all, while newer ones may have a considerable amount.

In most properties built between 1960 and 1978, it is reasonable to expect that fewer surfaces with lead-based paint are present. For

Table 3.1 Summary of Steps in Planning Lead Hazard Control Projects

<ol style="list-style-type: none"> 1. Review of existing conditions/preliminary determination of lead hazard control strategy, including historic preservation requirements. 2. Evaluation of lead hazards. 3. Selection of specific lead hazard control methods. 4. Selection of resident protection and worksite preparation level. 5. Development of specifications.* 6. Initiation of pilot project.* 7. Scheduling of other related construction work. 8. Selection of lead hazard control contractors. 9. Correction of preexisting conditions that could impede lead hazard control work. 10. Monitoring the work and cleanup process. 11. Clearance (and certification if required by the local jurisdiction). 12. Arrangement of ongoing monitoring and reevaluation.
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* Not necessarily required in single-family dwellings.

Table 3.2 Privately Owned Dwellings With Lead-Based Paint (by Age and Amount)

Construction Year	Total Occupied Units ¹	Percent With Lead-Based Paint ²	Average Surface Area With Lead-Based Paint (≥ 1 mg/cm ²) on Interior and Exterior Surfaces ³ (square feet)
1960–1979	35,681,000	62%	466
1940–1959	20,476,000	80%	1,090
Before 1940	21,018,000	90%	1,996

Source: *Comprehensive and Workable Plan for the Abatement of Lead-Based Paint in Privately Owned Housing: A Report to Congress* (HUD, 1990b).

¹ Total units data are from the 1987 American Housing Survey.

² The approximate 95% confidence intervals for the estimated percentages are: 1960–79 and before 1940 = +/- 10%, 1940–59 = +/- 9%.

³ Calculated from Tables 3–14 and 3–15 of the Comprehensive and Workable Plan. Average is calculated using only units with lead-based paint.



these properties, inspection (see Chapter 7) or a lead hazard screen risk assessment (see Chapter 5) is often most cost effective to determine whether lead-based paint or lead-based paint hazards are present. These newer properties still require hazard evaluation, since there is some evidence that significant levels of lead-based paint were sold up to at least 1971 (*New York Times*, 1971).

It is unusual but not impossible to find lead-based paint in houses built after 1978. For example, some health departments still periodically confiscate new residential paint containing illegal amounts of lead (Massachusetts, 1992). Since 1978 the Consumer Product Safety Commission has permitted no more than 600 $\mu\text{g/g}$ (0.06 percent) of lead in residential paint. Thus, because the use of lead in paint had almost ceased by 1978 and because of the need to focus scarce resources, houses built after 1978 are not targeted for inspection or risk assessment, unless a child with lead poisoning is identified. In some dwellings, historic preservation requirements may apply (see Chapter 18).

C. Capital Replacement Plans (Expected Useful Dwelling Life)

Future plans for the building play an important role in deciding whether long-term or short-term approaches are best. If the building is expected to be demolished within 3 years, a substantial investment in the form of abatement makes little sense. In this case a risk assessment and interim controls are clearly best. Furthermore, if no children or pregnant women will be present inside the building, hazard control measures are only necessary to protect the environment and maintenance and demolition workers. If substantial comprehensive renovations are planned, it may be efficient, and often necessary (for safety reasons), to integrate lead abatement into the project. Before capital replacement projects are performed, all painted surfaces that will be disturbed should be inspected. It is probably cost effective to carry out a full lead-based paint inspection at this time to determine if additional work can take care of other lead-based paint at the same time. Inspection is especially

important if the construction process will disturb painted surfaces and generate a substantial amount of dust. If lead-based paint is present in such a project, the renovation process should be designed to prevent leaded dust from being dispersed throughout the housing environment. If no lead-based paint is found, any construction work can proceed in the usual fashion. If replacement or enclosure of certain components is already planned, this work may accomplish abatement of those components. These components should be inspected to determine whether the project requires additional safety controls. For building components that can be readily removed or enclosed without generating significant amounts of leaded dust, the work can usually proceed safely with the addition of a few simple controls.

If abatement of asbestos or other environmental hazards is planned, it may be cost effective to combine this work with lead abatement. Although there are some important differences, many requirements for containment and cleanup for both lead and asbestos abatement are similar (for example, use of high-efficiency particulate air (HEPA) vacuums and respirators). Therefore the same firm may be able to carry out both types of work, if certified to do both.

D. Management and Maintenance Issues

Abatement is a relatively permanent response to lead hazards; interim control is a repeated, temporary response. Both can produce lead-safe dwellings. Abatement normally requires an intensive effort at considerable inconvenience, but can usually be completed within a brief timeframe. To be consistently effective, interim controls require an ongoing effort as well as some inconvenience and expense at periodic intervals.

For example, painted surfaces must be examined regularly and kept in good condition. If significant dust and soil hazards were found as a result of risk assessment, dust and soil sampling may have to be repeated on a regular basis. If recontamination occurs after interim controls,



cleanup and paint stabilization will have to be repeated.

The interim control option requires that control of lead hazards become a formal part of normal property management. Owners and managers may choose to focus resources on a one-time, permanent abatement solution unless they are willing and able to carry out such a management regimen. Others may decide that ongoing management is appropriate for them. Regardless of the option chosen, the dwelling unit must be made lead-safe.

E. Resident Population

Children under 6 years old are especially at risk for lead poisoning and are most likely to be impaired as a result of exposure (CDC, 1991b). Dwelling units where young children currently reside, or vacant units that may be occupied in the near future by a family with a young child should be given high priority for hazard control. Pregnant women also are at risk, so units with pregnant women are also high priority. Eventually, *all* older dwellings will require treatment, since one cannot predict with certainty which dwelling units will house children or pregnant women.

It is worth noting that owners who refuse to rent dwellings to families with young children or pregnant women may be in violation of the Federal Fair Housing Amendments Act of 1988.

F. Cost and Financing

The cost of lead hazard control varies enormously with the size and condition of the dwelling unit and the soil at the dwelling site, the treatments selected, local wage rates, the competitiveness of the market, and other factors.

In 1991 HUD estimated that more than half of all housing units with lead-based paint could be abated for less than \$2,500 (HUD, 1991). These estimates did not include testing or relocation costs. Abating all hazards in older dwelling units with substantial deferred maintenance can be much more expensive. Owners should not assume the cost of abatement is prohibitive until proper inspection has been completed, lead hazard control options have been identi-

fied, and costs have been estimated by qualified abatement contractors. Variables that should be considered in constructing a reliable cost estimate are described in Section VI of this chapter.

Although there are very little historical data on interim control costs, it should be assumed that, in the short run, interim control is far less expensive than abatement. In the long run, interim control may eventually exceed the cost of abatement due to ongoing maintenance, reevaluation, and cleanup.

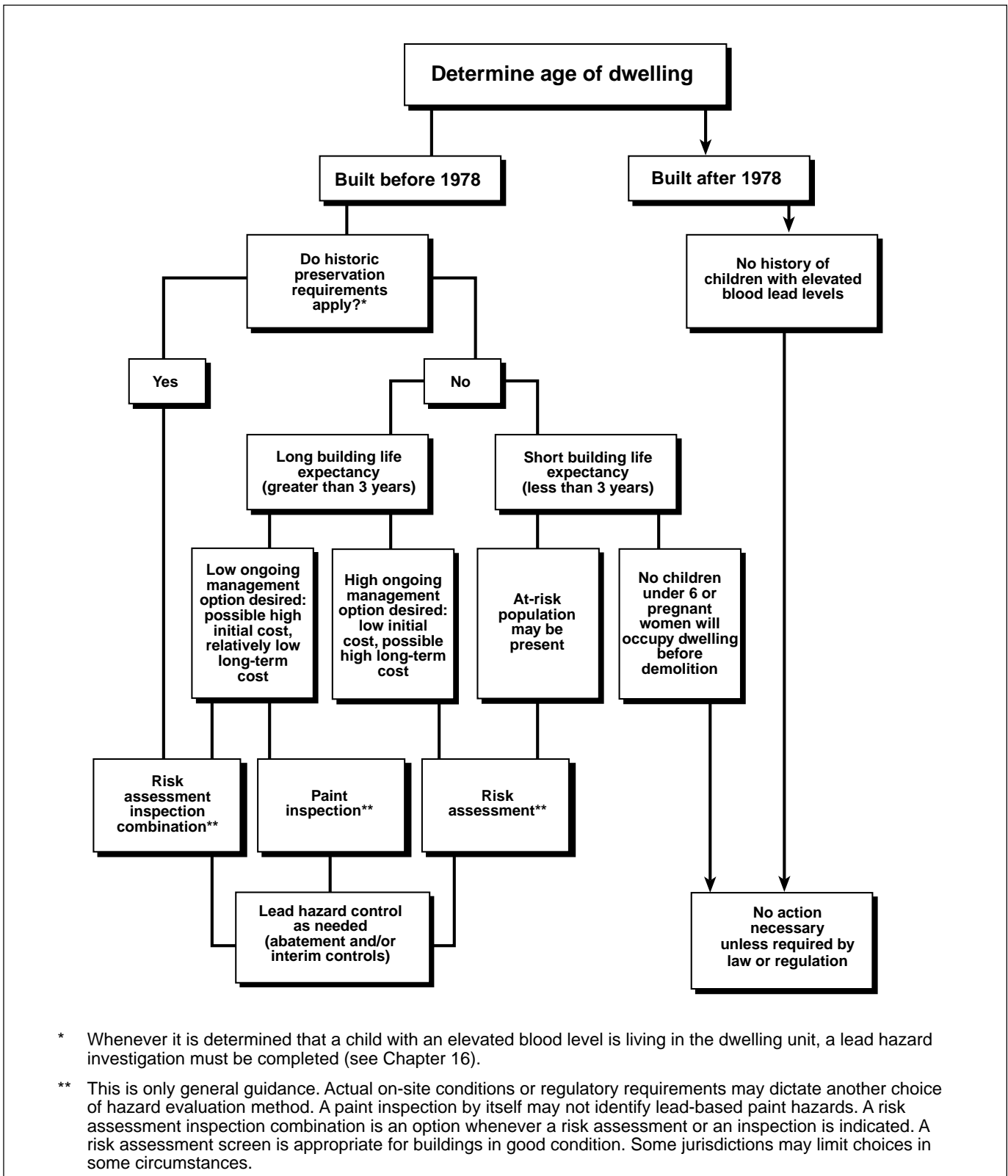
Some properties may be eligible for loans and grants under public programs usually administered by State or local housing and/or health departments. If private loans are to be used to finance the project, the properties and the lead hazard control project will probably need to meet the requirements for home improvement (generally only available for owner-occupied properties) or other equity-backed loans (first and second mortgages). Financing for these activities will be subject to the same loan underwriting requirements that apply to other types of building improvement financing. Such programs generally favor substantial capital improvements that can clearly be shown to increase the value of the property.

G. Preliminary Determination of Lead Hazard Control Strategy

After reviewing these issues, the next step is to decide on an overall lead hazard control strategy. For example, if an older building has multiple deteriorated surfaces, an at-risk resident population, and a need or plans for replacement of several key building components, a combined risk assessment/ inspection followed by abatement may be the most appropriate lead hazard control approach. For other buildings with surfaces in "maintainable" condition and no immediate need for replacement of building components, risk assessment followed by interim controls (if necessary) may be appropriate.

Figure 3.1 provides a summary flowchart to aid in the decisionmaking process.

Figure 3.1 Risk Assessment vs. Inspection: Decisionmaking Logic.





H. Prioritizing Lead Hazard Evaluation and Control Efforts

The factors outlined above should assist a property owner with multiple housing units in deciding where to focus initial attention. It may not be feasible for owners to have risk assessments or inspections performed simultaneously at all properties. As long as the owner plans to identify all lead hazards in all dwellings in a timely manner, prioritizing units may be acceptable. For example, risk assessment and lead hazard control during unit turnover eliminates the expense associated with resident relocation. Older properties should generally be evaluated first, since they are more likely to contain lead-based paint. Dwelling units housing or likely to house children should also receive priority attention.

Unless prescribed by Federal, State, or local law, decisions on prioritizing are the responsibility of the owner and will need to be made on a case-by-case basis. This flexibility should provide the foundation for keeping costs as low as possible. The prioritized schedule should be documented in a lead hazard control plan.

IV. Lead Hazard Evaluation—Inspection and Risk Assessment

The review of existing conditions will usually determine whether the property owner should arrange for an inspection to determine the location and concentration of lead in painted and varnished surfaces or a risk assessment to identify lead hazards. If the property owner has already decided to abate all lead-based paint, a certified inspector technician should be retained to help determine what surfaces need to be abated. If no decision between interim control or abatement has been made, a certified risk assessor should be retained to sample dust and soil and suggest options for controlling lead-based paint hazards.

A. Bypassing the Lead Hazard Evaluation Step

In some cases where local laws or regulations prescribe lead hazard control measures or where there is every likelihood that lead-based paint hazards are present, the property owner may decide to forego lead hazard evaluation and proceed directly to lead hazard control. In that event the property owner should assume that all painted and varnished surfaces contain lead. The clearance examination should include a determination of whether or not some lead hazards were overlooked, since the initial lead hazard evaluation was not performed. In this case the clearance examination needs to be conducted by a certified risk assessor, not an inspector technician. However, when it is likely that only some of the surfaces to be treated contain lead-based paint, an inspection or risk assessment may be more cost effective, since up-front evaluation enables the lead hazard control activities to be more focused (HES, 1993).

B. Risk Assessment Costs

Risk assessment costs per dwelling unit vary according to the type of housing being studied. The cost per dwelling unit is lower in large multifamily housing than in single-family or small multifamily housing because environmental sampling is not required for every dwelling in large projects (see Chapter 5). For example, for an apartment complex with 200 similar dwellings, only 20 dwellings would have to be entered and sampled for risk assessment purposes, provided that construction and painting histories are uniform throughout the complex. Costs vary depending on local market conditions and can be expected to decline as the profession matures.

In the public housing program, about 50 percent of the cost of a risk assessment is attributable to the cost of analyzing environmental samples; the balance consists of activities such as visual inspection, data collection, sample collection, and report writing (HES, 1993). If extensive paint chip or soil sampling is required due to the presence of a significant amount of paint in poor condition, the sampling costs will



be higher. Since these conditions can only be determined in the field once the work starts, the risk assessor should provide a separate unit price for collection and analysis of additional samples.

C. Inspection Costs

The cost of inspection depends on the number of surfaces that must be tested, which in turn depends on the number of painted components. A typical 2-bedroom apartment or small house (5 to 7 rooms) has 40 to 80 painted interior components and 5 to 15 exterior components, all of which will need to be tested. A large single-family house may have far more surfaces to be tested, depending on the number of rooms, painted components in each room, exterior components to be tested, and surfaces that require confirmatory laboratory analysis of paint chips. A typical apartment unit or small-to-average single-family house can usually be tested in 2 to 3 hours by one person operating a single x-ray fluorescence (XRF) analyzer. An additional hour for report preparation is typically needed. Using the protocol in Chapter 7 and current XRF technology, it is not possible to inspect units for \$35–\$45, despite claims by some inspectors to the contrary. Owners are advised to examine closely the competence of inspectors submitting bids.

D. Key Elements in a Request For Proposals (RFP) for Risk Assessment and Inspection

Most public agencies are required to advertise publicly an RFP for consultant services, such as risk assessment and inspection, depending on the estimated value of the services. Although this is not a requirement for most private-sector solicitations, it is still advisable to draw up a list of the information that each proposer should provide and a list of factors by which different proposals can be competitively evaluated.

A formal RFP for a risk assessment or inspection should contain the general sections listed in Appendix 7.1. Such an elaborate proposal is not necessary in situations where agreements can be reached by private negotiation (for example, a risk assessment for a single-family home), but

these elements should still be considered before a proposal is accepted.

E. Monitoring the Risk Assessment/Inspection Process

The owner should monitor the risk assessment or inspection to ensure that all dwelling units and surfaces to be tested are in fact examined. There have been reports of inspectors providing fictitious testing data or skipping surfaces or even entire dwelling units. One way for the owner to ensure that services are delivered properly is to inform the inspector that a third party will repeat some of the testing as a quality control check. Alternatively, the owner can conduct unannounced surveillance of the testing campaign or can accompany the inspector/risk assessor as the work proceeds (see Chapter 7 for a detailed quality control plan for paint testing).

F. Reviewing the Risk Assessment Report

The contents of a risk assessment report should closely follow the format described in Chapter 5. The risk assessment report should include a section detailing the lead hazard control options (i.e., what the owner should do) for each of the lead hazards identified. For all lead hazard control methods except complete lead-based paint removal (via building component replacement or paint removal), a plan for monitoring and professional reevaluation should be described (see Chapter 6). Also the report should explain precautions needed to avoid creating additional lead hazards in the future.

G. Reviewing the Inspection Report

The inspection report should include documentation demonstrating that the testing work was done in conformance with the protocols in Chapter 7. The report should contain schematic floor plans for each unit or area indicating test locations, all raw measurement data, and the results after averaging and correction for substrate interference (if applicable). The report should document that an acceptable sampling scheme was followed. A table of



confirmatory test results and a summary table that shows the percentage of each component testing positive, negative, and inconclusive (multifamily housing only) should be included. The decisionmaking rules for classifying all surfaces in a dwelling (as outlined in Chapter 7) should be explained and applied properly. Finally, the report should state which components contain lead-based paint and which do not, and should include any recommendations for further testing.

V. Considerations in Selecting Control Methods

This section summarizes factors that should be considered in the selection of lead hazard control methods. (Specific techniques and the advantages and disadvantages of each type of lead hazard control are described in Chapters 11, 12, and 13. Before implementing the control measures, whether they be abatement or interim controls, decisions must be made regarding protective measures, the degree of containment (to protect residents), worker protection, cleaning and clearance, and waste management.

A. Containment and Resident Protection

Resident protection is an essential component of all lead hazard control work conducted in occupied units. Containment is also required to prevent dispersal of lead into soil or nearby dwellings. These measures are implemented by selecting one of the Worksite Preparation Levels described in Chapter 8. The Worksite Preparation Level should be defined in the project specifications. If there are no specifications, the certified contractor can select the level. The contractor and the property owner share responsibility for correcting any breach in the containment system. In all circumstances residents must never be permitted to enter the work area while work is underway. In some cases lead hazard control work can take place if the residents leave for the day or do not enter the work area until cleanup and clearance have been completed.

B. Worker Protection

The Occupational Safety and Health Administration (OSHA) regulations require that workers be protected whenever they are exposed to airborne leaded dust above certain levels or are performing certain construction tasks (29CFR 1926.62). (Some types of maintenance workers are covered by 29 CFR 1910.1025.) At this time no lead hazard control technique is automatically exempt from worker protection requirements, including encapsulation and enclosure. However, it is possible for employers to show that some of the requirements are not applicable by generating objective data from jobs in similar housing using corresponding methods with the same workers. Unless monitoring is completed showing that airborne lead levels are well below OSHA exposure limits, workers should wear half-mask respirators fitted with the correct HEPA filter for leaded dust particles and protective clothing, exercise proper personal hygiene (preferably onsite showers), and undergo medical surveillance. These measures will also prevent workers from taking home leaded dust on their shoes and work clothing, where their own children could be exposed. Some of these protective measures may not be necessary for low-level interventions (wet cleaning, for example). The cost of meeting OSHA requirements must be taken into account in any lead hazard control effort. Chapter 9 provides further guidance on implementing the OSHA lead construction standard in the housing industry.

C. Cleanup and Clearance Requirements

The lead hazard control method selected will determine the extent of the cleanup required. For very low-lead, dust-generating jobs, careful wet cleaning alone may suffice. For most interim control and abatement jobs, a HEPA vacuum cleaning, followed by a wet wash, and final cleaning with the HEPA vacuum, is the best way of meeting clearance standards. For jobs generating more leaded dust, one or more HEPA/wet wash/HEPA cycles may be required (see Chapter 14).

At the end of the job, a clearance examination is conducted to document that the area is safe



to be reoccupied, all work was completed, and cleaning was adequate. Chapter 15 explains clearance requirements.

D. Waste Disposal

The cost of waste disposal and waste testing should be considered when deciding on a lead hazard control strategy. Waste characterization must be done before shipping leaded debris to disposal facilities. If waste is found to be hazardous, its handling, transport, and disposal are subject to strict regulation (see Chapter 10).

The cost of hazardous waste disposal may be a key factor in selecting abatement methods, particularly because it can significantly affect the project budget. Therefore, testing to characterize wastes should be performed as early as possible in the planning process. Additionally, a plan for segregating hazardous and nonhazardous waste is needed to avoid labeling all waste hazardous. Also, contractors must know if waste is hazardous in order to submit accurate bids; otherwise, they may estimate costs on differing bases, making it difficult to compare bids.

If the project will generate hazardous wastes, waste minimization should be investigated. Hazardous waste costs are dependent on the volume and sometimes the weight of the waste deposited in a landfill. Costs may be significantly reduced by minimization and segregation of wastes into different categories.

E. Extent of Concurrent Work

Lead hazard control measures will be effective only if components and substrates are structurally sound and in reasonably good condition. Structural deficiencies and any possible sources of water infiltration must also be addressed before lead hazard control activities are undertaken. Cost estimates should clearly reflect these additional requirements.

When the work begins, the contractor may need extensive access to the units, common areas, and worksite. Corridors, stairs, elevators, streets, walkways, and site spaces may have to be used for lead hazard control activities. The existing uses of these spaces may have to be sus-

pending until the work is done. Fire escape routes and exits must never be blocked, however, unless alternative routes are approved by local fire authorities.

Mechanical and electrical fixtures may have to be removed before lead hazard control work can be accomplished. For example, if exterior siding is being replaced, light fixtures, electrical power outlets, cable TV conduits, and telephone and water services may impede the work. If interior walls are being abated, electrical fixtures and radiators may have to be removed.

VI. Considerations in Cost Estimating for Abatement

The price for a lead hazard control job will depend on the:

- ◆ Hazard control methods/strategies.
- ◆ Building components being treated.
- ◆ Extent of the work.
- ◆ Location of the job.
- ◆ Individual circumstances of the job.

A. Type of Dwelling Unit

Overall lead hazard control cost depends on the type(s) of units being worked on. Multifamily dwelling units are the least expensive because their size is usually limited and the work is highly repetitive. The cost is much lower than for treatment of a detached single-family house, unless common areas, like stairs and hallways, are included.

A common two-story rowhouse is relatively inexpensive to treat because there are no side windows (except in end units). The price will increase if the rowhouse is three stories, since the third floor adds a flight of stairs and two or more additional rooms. Some turn-of-the-century rowhouses near the urban centers of older cities are quite sizable, particularly in terms of ceiling height and property depth, and have elaborate moldings; this will potentially increase the cost of the treatment.



Semidetached dwellings, such as duplexes and triplexes, include a bank of windows going down one side of the home and are comparable to an end-unit rowhouse. Overall, this type of residence has more square footage than the standard rowhouse and treatment price will rise accordingly.

Generally, single, freestanding dwellings are the most expensive to treat. Windows are on all four sides and attics, basements, garages, and elevated porches (both front and back) are common. If the exterior is painted, the lead hazard control cost will be relatively high.

These general principles have important limitations. All homes are unique and abatement requirements are specific to the particular dwelling.

B. Number of Building Components To Be Treated

The number of components being treated will directly affect the cost. Older houses generally contain a greater number of components for two reasons. First, houses with lead-based paint that were built between 1960 and 1980 contain an average of only 466 square feet of lead-based paint, while those built before 1940 contain an average of nearly 2,000 square feet (HUD, 1990b) (see Table 3.2). Second, older homes also have more decorative components, such as crown moldings, chair rails, wainscoting, and carved fireplace mantels. In addition, older homes typically contain more coats of paint, rendering the paint on components more difficult to remove.

C. Types of Items

The types and ornateness of items to be treated will influence costs. For example, it is expensive to treat flights of stairs with spindles, newel posts, handrails, stringers, and skirt boards. Painted kitchen cabinets are also costly to treat. Homes with radiators are more expensive to treat than homes with hot-air registers that can be replaced inexpensively.

A significant portion of the total cost of treatment (perhaps as much as one-third) will be

devoted to enclosed porches with window and screen frames; wood panels with framing under the windows; wide porch pillars; painted porch steps and floors; porch ceilings and support beams; the cornice, soffit, and fascia; fat “vase”-styled spindles; wide upper and lower rails; and the exterior side of the front living room windows within the porch enclosure.

Generally, the more ornate the components and the more difficult they are to work with, the higher the cost of the job.

For historic properties lead hazard control is difficult because acceptable methods can be restricted. Generally, replacement of original components is not desirable, nor is their enclosure or encapsulation, since the detail and the integrity of the trim usually must be preserved. Some strippers may damage plaster and soft woods, and the use of heat guns in a historic dwelling can create fire hazards. Methods must be specifically tailored to the unique circumstances of the individual situation. Typically, restrictions are stringent and costs are correspondingly high for these properties (see Chapter 18).

D. Wage Rates

As a general rule, labor accounts for two-thirds of the direct field cost in lead hazard control work. Therefore, labor-intensive treatments are generally more expensive.

E. Resident Status

If the lead hazard control job, including clearance, is to be performed so that the resident can return to the dwelling unit each night, or is restricted from certain work areas in progress, then the job will be substantially more complicated than one performed on a vacant dwelling. For example, a bathroom must be kept available for the residents.

Should the residents move but leave their belongings in the dwelling (to be moved from room to room or covered to prevent dust contamination), the job will also be substantially more expensive than work performed in a vacant dwelling, for three reasons. First,



continuously moving furniture and personal effects is labor-intensive. Second, liability for breakage, which includes appliances and electronics, must be considered. Third, moving furniture back into a room may reduce the likelihood of readily achieving the very low leaded dust levels necessary for clearance when the entire house is completed. For all these reasons, it is preferable to undertake major control projects in vacant units whenever possible.

F. Security

Properties in the care, custody, and control of contractors may be the contractors' contractual responsibility. When vandalism or theft is a valid concern, the cost of the job can increase.

G. Utilities

The absence of utilities (heat, electricity, and water) necessary to perform certain lead hazard control activities should be factored into the cost of the hazard control. Dwellings that have been vacant for a long period of time can present special problems. In order for paint-removing chemicals to work, encapsulants to cure, and adhesives to dry, the property must have heat in cold weather. If home heating units are not functioning or are missing, then either expensive repairs need to be performed or potentially costly alternatives considered.

Electricity is required for the operation of power tools, HEPA vacuums, and heat guns. Restoring wiring or providing new electrical service to the property is expensive. Using portable generators is often insufficient and inefficient and presents a capital expense and maintenance cost.

Water is required for worker cleanup and for achieving compliance with clearance standards. It would be inconvenient and expensive to transport large quantities of water to and from the property. Water may have to be hauled away if waste systems are not functioning because it cannot be poured into the ground. Discharge must always be coordinated with local water treatment authorities.

H. Clearance

As a job is completed, clearance from a certified risk assessor or certified inspector is always appropriate. If no preliminary risk assessment was performed, the final clearance should only be performed by a certified risk assessor, since certified inspectors are not trained to identify hazards. Downtime caused by delayed clearance testing can be costly; proper scheduling is essential.

I. Site Access

To contain costs, contractors should ensure, prior to the start of the job, that workers have access to elevators in high-rise buildings. Similarly, in a housing development, the contractor's trucks should have close access to the dwelling units treated.

J. Job Design

Lead hazard control in large multifamily buildings must be carefully planned to permit efficient phasing of the work. Initially, the owner should plan to set aside available dwelling units for lead hazard control during vacancy turnover. It is likely that the first wave of work will be scattered throughout a housing development or various floors of a multifamily building. Thereafter, these abated vacant units should be filled with residents from a single floor or housing block. It is critical that family size and housing size be matched. The job should then progress in a linear path, from floor to floor and block to block. The residents thereby retain the same neighbors and are not relocated to new areas that affect transportation, merchant relationships, day-care facilities, and school access.

The job can then be executed in a more controlled and economical way that saves money and consolidates workers in a given area. Working floor by floor in multifamily housing also mitigates residents' concerns and logistics over worker contamination of common areas.

K. Hazardous Waste

Costs associated with waste disposal can be substantial. See Section V of this chapter for further details.



L. Other Costs

The following factors can also affect the cost of performing a lead hazard control job:

- ◆ Additional worker training to meet OSHA requirements.
- ◆ Poorly defined terms and work items, and illogical work sequencing through the dwelling, resulting in missed items and abatement of incorrect items.
- ◆ Delays in resident departure.
- ◆ Dwelling insufficiently cleared of trash and belongings.
- ◆ Weak floors, stairs, or other structural components.
- ◆ Delayed fumigation (if required).
- ◆ Inexperience.

VII. Specifications

The property owner should consider whether a detailed set of specifications is needed. For most single-family homes, a detailed set of specifications may not be appropriate. However, for large multifamily housing projects, carefully prepared specifications can help prevent confusion in bidding and job completion. It is beyond the scope of these *Guidelines* to provide a model set of specifications that can be tailored to specific properties. However, an example of a project specification is provided in Appendix 7.3. (This should be modified substantially for each individual job.) A model specification may also be available in the future from the National Institute for Building Sciences.

VIII. Pilot Projects

The methods of abatement and interim control in these *Guidelines* have been found to be generally safe and effective, but to date some of them have not been tested repetitively in a wide variety of housing situations. Therefore, it is advisable to test the safety and effectiveness of the methods and controls selected “onsite.” Pilot projects can be used to answer a variety of ques-

tions, such as whether hazardous waste will be involved, encapsulants will be effective, paint removers will actually work, and excessive levels of dust will be generated. Pilot projects are most appropriate when a large-scale multifamily project is being considered and whenever there is uncertainty about the safety and effectiveness of a particular lead hazard control process.

In pilot projects a representative portion of the total project is carried out and carefully evaluated. The pilot project work should be performed as closely as possible to the way the larger project will be performed, including carrying out specific lead hazard control work, scheduling activities, and integrating other work. This type of pilot study should be evaluated by a risk assessor along with environmental sampling to document that the work is being adequately controlled. Pilot projects should be performed in vacant units whenever possible.

IX. Coordination of Lead Abatement With Other Renovation Work

Lead hazard control work should be coordinated with other renovation work performed as part of the same project (see Chapter 4). For abatement work it is generally preferable, and sometimes necessary, to complete the abatement work *before* all other renovation work. This may permit most of the construction work to be done in a traditional way without worker protection. For example, it would be necessary to abate certain lead-based painted surfaces in a kitchen or bath before attaching new fixtures or cabinets. This approach simplifies coordination of the subsequent construction work, since renovations are not started until the abatement is complete.

However, for some projects it may be difficult to separate lead hazard control and renovation. In such cases the role of the abatement contractor may have to be expanded to include general carpentry and other construction activities. Alternatively, the work of certain trades may have to be done under abatement conditions. For example, to remove and replace a window and attached trim covered with lead-based paint, an



abatement worker with carpentry skills is valuable. Similarly, in a situation where there is lead-based paint on interior walls and ceilings, it may be more efficient for an electrician to work under abatement controls rather than have an abatement contractor remove paint from walls and ceilings.

X. Insurance

There are three types of insurance that owners, consultants, and contractors should consider acquiring:

- ◆ General liability insurance (all parties).
- ◆ Pollution liability insurance (all parties).
- ◆ Errors and omissions (E&O) insurance (for consultants).

General liability insurance and E&O insurance are widely available in the commercial insurance market; however, pollution liability insurance is not. Standard policy forms almost always contain a strict pollution exclusion clause and therefore do not cover lead-based paint abatement activities.

Each of the parties involved in the project should discuss adding pollution liability coverage with their general liability or E&O carrier. Some insurance companies do offer specialty policies that insure lead abatement activities under limited terms and conditions.

Unfortunately, insurance and bonding for lead abatement activities are not widely available in the general insurance market at this time. Further, the few insurance policies that are being offered vary greatly in terms of cost and quality of coverage provided.

For these reasons, if the building owner, contractor, risk assessor, inspector technician, or planner decides to acquire insurance, sample copies of all insurance policies should be obtained beforehand to determine if the coverage will apply to the unique exposures in lead hazard control work. On large projects a professional insurance broker knowledgeable about such coverage should be consulted to review the

policy forms and evaluate the financial strength and viability of the insurers providing the coverage. The insurance should be occurrence-based, not claims-based.

The certified contractor and the risk assessor, inspector technician, or planner who elects to purchase insurance should maintain applicable policies in force for the entire term of the project, from bid acceptance to final completion of the work. They should also ensure compliance with clearance criteria and the removal of all equipment, supplies, and employees. Policies should not be canceled for any reason without written notice of at least 30 days to the building owner. Ideally all parties should submit Certificates of Insurance to the building owner at least 10 days before beginning operations or at any preconstruction meeting, whichever is sooner.

A. Commercial General Liability (CGL)

CGL insurance is readily available at reasonable cost. The policy should be written on an “occurrence” basis, and include premises and operations liability, contractual liability, independent contractors liability, and products and completed operations liability. If available at a reasonable cost, the policy should be specifically endorsed and/or written to include coverage for lead abatement operations and eliminate or modify the “pollution exclusion” clause so that it will not exclude lead hazards, exposures, poisonings, or claims. Limits of liability of \$1,000,000 per occurrence with a \$2,000,000 policy aggregate, for bodily injury and property damage, are recommended. The building owner should also be named as an “additional insured” on all such policies.

Occurrence policies require that there be bodily injury or property damage caused by an accident during the policy period, including continuous or repeated exposure to harmful conditions. There is no restriction on when a resulting claim or suit must be made or brought against the insured, as there is in a “claims-made” policy.



B. Professional Liability Errors and Omissions (E&O)

In addition to CGL insurance, the risk assessor, inspector technician, and/or planner should consider carrying E&O insurance coverage if it is available at reasonable cost. The policy will typically be written on a “claims-made” basis and cover professional services rendered in connection with risk assessments, inspections, environmental sampling, project supervision and monitoring, and specification writing. Again the policy should eliminate or modify the “pollution exclusion” clause so that it will not preclude coverage for acts, errors, or omissions that result in lead hazards, exposures, poisonings, or claims. Limits of liability of \$1,000,000 per claim with a \$2,000,000 policy aggregate are appropriate.

“Claims-made” policies require that either bodily injury or property damage be caused by an “occurrence” that occurs during the policy period *and* results in a claim or suit first made against the insured and reported to the insurer during the policy period. Virtually all E&O policies available today are written on a “claims-made” basis; “occurrence” coverage is not an option at this time.

C. Bonding

In addition to insurance, performance bonding may be required for some large projects.

XI. Project Completion

No interim control or abatement project is complete until compliance with clearance

standards has been achieved and a final report prepared.

A. Clearance

The work area cannot be released to residents until a visual evaluation and dust sampling have been completed. If these tests show that all work was performed satisfactorily and lead dust is not present above clearance standards, then the area can be considered to be safe for residents. If work was not completed or if there is an excessive amount of lead dust remaining, additional work and cleanup are required until final clearance is achieved (see Chapter 15 for more detailed information on the clearance process).

B. Final Report

A final report should be prepared by the professional who is conducting the clearance examination, to document the work and any ongoing monitoring and professional reevaluation that may be required in the future by the owner. If applicable, the date for the next reevaluation by a certified professional should appear in the report. EPA regulations may require final reports in some situations. The report will become an important document that should be transferred from one owner to the next as part of the disclosure requirements in Title X. Some jurisdictions may also require that certificates be provided to owners as proof of completion of lead hazard control work; these will also become part of the disclosure record. Owners and clearance examiners are responsible for maintaining such records.