C. Paint Sampling

As part of the risk assessment, the risk assessor should determine whether any deteriorated paint is lead-based and therefore constitutes a lead hazard. If a paint inspection has been conducted, and the risk assessor believes that the inspection adequately follows the principles of testing described in Chapter 7, then the inspection results should be used to determine which deteriorated surfaces are lead hazards. If an inspection has not been completed, or the risk assessor questions its reliability, building components that exhibit deteriorated paint should be analyzed. Paint-chip samples should be collected, or measured by x-ray fluorescence (XRF) analysis after dust sampling is conducted in order to minimize the possibility of cross-contamination of dust and paint samples.

1. Evaluating Previous Paint Testing

If previous testing of lead-based paint has been completed, the risk assessor should review the testing report to determine if the results are reliable. Past inspections may not conform to current standards of care and may not have accounted for important sources of error, possibly resulting in an incorrect determination of the location of lead-based paint.

The risk assessor should review the previous report using the checklist shown in Table 5.4. Chapter 7 contains detailed instructions on how repeated paint inspections can be completed.

If the answer to any of the Table 5.4 questions is negative, the past inspection or a portion of that inspection may not be reliable. All surfaces with questionable readings should be treated as though they were never tested. If the inspection report will be used to make decisions in the future, the owner should be encouraged to retest all of the surfaces where the results are questionable. It is usually not necessary to retest all surfaces.

If Table 5.4 indicates that paint testing was adequate, the risk assessor can use the previous results without additional sampling.

2. Deteriorated Paint Analysis

Deteriorated paint analysis can be performed with either a portable XRF lead-based paint analyzer or by laboratory paint-chip analysis. More information on XRF testing can be found in Chapter 7. Risk assessors should be aware that most XRF analyzers can only be used on surfaces where the paint is intact over an area of at least 3 square inches with all layers present. XRF testing should not be used to analyze peeling paint or paint chips. Peeling or chipped paint should only be analyzed by a laboratory, unless an intact area nearby can be used for XRF analysis. Other methods, such as spreading pulverized paint chips out on a sheet of paper and then analyzing them by XRF, should not be used for risk assessment purposes at this time because equivalence with other standard analytical methods has not been established.

Paint-chip samples for laboratory analysis are collected by removing all layers of paint from the surface without removing any substrate. It is important to collect all layers of paint from a sample location, not just the peeling layers. All layers of paint should be included in the sample for the following reasons: (1) All layers may be removed during the scraping involved in preparing the surface for repainting (repair process); (2) the result of the paint-chip analysis should be comparable to an XRF reading, which reads all layers; and (3) the cost of analyzing a single layer is the same as the cost of analyzing only the deteriorated layers. A complete protocol for sampling paint (intact, as well as deteriorated paint) can be found in Chapter 7 and Appendix 13.2. Minor cleanup of the immediate area should be done with wet wipes following any destructive paint-chip sampling effort.

One paint-chip sample should be collected from all similar building components with deteriorated paint that have similar painting histories. Paint chips should be collected from the exterior as well as the interior of the dwelling. As a rule of thumb, no more than five deteriorated painted surfaces are sampled for most risk assessments. If more surfaces must be sampled,
Table 5.4 Review of Previous Lead-Based Paint Inspections

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Did the report clearly explain the entire testing program and include an executive summary in narrative form?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Did the report provide an itemized list of similar building components (testing combinations) and the percentage of each component that tested positive, negative, and inconclusive? (Percentages are not applicable for single-family dwellings.)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Did the report include test results for the common areas and building exteriors as well as the interior of the dwelling units?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Were all of the painted surfaces that are known to exist in the dwelling units, common areas, and building exteriors included in the itemized list of components that were tested?</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>If confirmation testing (laboratory testing) was necessary, did the testing or inspection firm amend the final report and revise the list of surfaces that tested positive, negative, and inconclusive?</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Was the unit selection process performed randomly?</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Is the name of the XRF manufacturer and the model, serial numbers of the XRF that was used in each unit recorded in the report?</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Did the report record the XRF calibration checks for each day that testing was performed?</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Did the calibration checks indicate that the instrument was operating within the Quality Control Value (see Chapter 7)?</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Were the required number of readings collected for each surface?</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Were substrate corrections performed (if necessary)?</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Were confirmatory paint-chip samples collected if XRF readings were in the inconclusive range?</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Was the procedure that was used to collect the paint-chip samples described?</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Was the laboratory that analyzed the paint samples identified?</td>
<td></td>
</tr>
</tbody>
</table>

The owner should consider having a paint inspection done together with the risk assessment (see Chapter 7).

Wet chemical field test kits should not be used to analyze paint at this time. Although they demonstrate promise for the future, the chemical test kits are not yet sufficiently reliable for routine analysis of deteriorated paint, dust, or soil (RTI, 1991; Jacobs, 1991a; CMHC, 1993). However, if it is not possible to conduct XRF or laboratory paint-chip analysis, the kits may be used. Current EPA/HUD recommendations on the use of these kits can be obtained by calling 1-800-LEAD-FYI. It is possible that some kits may be approved in the future (see Chapter 7).

Composite Paint-Chip Sampling. A risk assessor can choose to perform either single-surface or composite sampling of paint chips. Just as in composite dust sampling, it is possible to lower
the cost of paint-chip analysis by combining individual samples into a single sample (i.e., by choosing composite sampling over single-surface sampling). As with all composite sampling, composite paint-chip sampling provides limited information in that it will not reveal exactly which surface is coated with lead-based paint. To conduct composite paint-chip sampling, each subsample added to the composite should be equal in size (about 1 square inch) and weight. For this reason, compositing of paint chips is best performed in the laboratory, where size and weight can be controlled. Due to laboratory restrictions, no more than five subsamples should be included in a single composite paint-chip sample. The laboratory must be instructed to analyze the entire sample (not a portion of the sample), or to completely homogenize the entire sample and analyze a sub-sample. Homogenization procedures are available from the EPA Lead Information Center (1–800–LEAD–FYI).

The lead-based paint standard should be divided by the number of subsamples contained in the composite sample to determine if any individual subsample can be above the standard. As shown in the following equation:

\[
\text{Composite} = \frac{\text{Paint Standard}}{\text{Number of Subsamples}}
\]

Consider the following example: A risk assessor identifies five surfaces with deteriorated paint. All five surfaces are sampled in an equivalent manner. Half of each sample is retained (in a separate container) by the risk assessor or laboratory, and half is used to form a single composite paint-chip sample. Since there are five subsamples, the composite lead-based paint standard for this sample is:

\[
\frac{1 \text{ mg/cm}^2}{5 \text{ subsamples}} = 0.2 \text{ mg/cm}^2
\]

or

\[
\frac{5,000 \text{ µg/g}}{5 \text{ subsamples}} = 1,000 \text{ µg/g}
\]

If the laboratory results are less than 0.2 mg/cm² or 1,000 µg/g, none of the individual subsamples can possibly contain lead at or above the national standard of 1 mg/cm² and therefore no further action is necessary. If the lab result is greater than 0.2 mg/cm², the paint subsamples that were retained should be submitted for individual analysis to determine if any of the subsamples contain lead equal to or greater than 1 mg/cm² or 5,000 µg/g. Composite paint-chip sampling is essentially a negative screen (i.e., it can prove that lead-based paint is not present). Proof that lead-based paint is present can only be established through single-surface sample analysis.

Composite sample results can be expressed in either mg/cm² or µg/g. To report the results in mg/cm², all subsamples must have the same surface area. To report the result in µg/g, all subsamples must be of equal weight. Since it is not feasible to weigh samples in the field, composite paint-chip samples should generally be reported in mg/cm² (i.e., it is feasible to measure the size of the area of the paint sample).

Why is the standard for a composite paint chip samples reduced while the standard for a composite dust sample remains unchanged, regardless of the number of subsamples included? The answer involves how the results will be used. The composite dust sample will determine whether cleaning is needed across all floors or all windows. The cost of cleaning an additional room is marginal, especially if the unit is vacant. However, deteriorated paint may be repaired in a number of different ways, making it necessary to know exactly which surface is contaminated. A basement or interim control of a single building component may cost hundreds of dollars, while the cost of cleaning an additional room is far lower. Thus, composting for paint is essentially a screening process to determine whether or not it is possible for any subsample to be above 1 mg/cm². For dust, the composting process yields an average across all surfaces to determine if cleaning is needed. All dust and paint-chip composting must be carefully coordinated with the laboratory.

Chewed Surfaces. Surfaces with deteriorated paint and surfaces that have been chewed (or
where chewing and mouthing are reported) should be tested. Chewed surfaces could include interior window sills, balusters, shelves, stairs, and other surfaces accessible to children’s mouths. Deteriorated paint surfaces that display teeth marks or that have been identified as a site of mouthing should be analyzed either by paint-chip analysis or XRF testing. Surfaces with intact paint where chewing or mouthing is suspected should be analyzed with an XRF analyzer, when available. Although a chewed surface is by definition deteriorated, paint-chip sampling is not recommended for intact, chewed surfaces unless the surface can be covered with a durable material immediately. Disturbing intact paint may make a child more curious about the surface and may increase the likelihood of exposure. If no testing occurs, the surface should be assumed to be a lead-based paint hazard, and should be treated accordingly.

Intact Paint on Friction and Impact Surfaces. In general, paint-chip samples should not be collected from intact paint in good condition, since intact paint does not pose a lead hazard. Intact paint on friction or impact surfaces also does not need to be sampled, since any dust hazards that are being produced will be identified by dust sampling. If worn paint is seen on a friction or impact surface, the risk assessor should consider collecting a dust sample near that area. XRF or paint-chip analysis of worn painted areas is not recommended, since some of the lead-containing layer may have worn away. Usually, thicker sections of paint film should be analyzed to determine the presence of lead-based paint.

There is one exception to the general rule against sampling intact paint: If certain areas of intact paint are expected to be disturbed in the future due to renovation, maintenance, or other work, the paint in those areas should be analyzed by paint-chip analysis or XRF testing.

Deteriorated lead-based paint on furniture also constitutes a lead hazard, but it is the responsibility of the owner of the furniture to resolve those hazards. A risk assessor should strongly recommend to dwelling owners that any furniture with deteriorated paint be analyzed. In rental dwellings, deteriorated paint from resident-owned furniture need not be sampled, since the building owner does not own the furniture and cannot control its correction if a hazard is found. However, the risk assessor should suggest to property owners that it may be in their best interest (as well as the interests of the residents) to identify all lead-based paint hazards. In some cases, the residents themselves may agree to pay for an analysis of their furniture. Whoever pays for the analysis, it must be clear that the responsibility for treatment or removal of any resident-owned furniture rests with the resident. When no paint samples are collected, the risk assessor should still record the presence of deteriorated paint on old furniture in the final report.

D. Soil Sampling

The risk assessor should determine whether the soil outside of a dwelling poses a significant hazard to children. To accomplish this, it will be necessary to determine not only the concentration of lead in the soil, but also the use pattern (i.e., the frequency of contact and use of soil) for different soil locations and conditions. Since only areas of bare soil are considered potential lead-based paint hazards under Title X, the risk assessor should only sample areas of bare soil unless otherwise requested. Except for play areas, yard or soil areas containing a total of less than 9 square feet of bare soil are not considered to be hazardous and need not be sampled. A property owner may wish to have additional sites sampled if the ground covering on those sites may be disturbed in the future (e.g., by gardening or excavation).

Bare soil areas to be sampled for lead contamination include:

- Outdoor play areas.
- Building foundation or drip line.
- Vegetable gardens, pet sleeping areas, bare pathways.
- Sandboxes.
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E. Water Sampling

Water sampling is not required for a routine risk assessment, but may be requested by the property owner. Local water authorities are already mandated by the EPA to monitor the lead levels of the water they supply. If the owner is concerned that lead may be leaching into the water between the service line and the faucet, samples can be collected and analyzed using the standard EPA protocol (see Appendix 13.5).

F. Lead Hazard Screen Risk Assessment Sampling Protocol

For a lead hazard screen risk assessment, the first step is to determine whether the dwelling is in good condition by completing Form 5.1. The risk assessor should take a 5- to 15-minute tour of the dwelling to note paint and building conditions, and to decide where to take dust samples. If the assessor observes painted surfaces in “poor” condition, then paint samples should be collected (or the painted surfaces should be measured by XRF) during the lead hazard screen risk assessment. The deteriorated paint sampling protocol in a screen is identical to the sampling performed in a full risk assessment. The lead hazard screen risk assessment is unlikely to be cost effective in dwellings in poor condition; in these situations, a full risk assessment should be completed to avoid the expense of a screen and a repeated trip to the site by a risk assessor.

In a lead hazard screen risk assessment, two composite dust samples are collected, one from the child’s principal play area, one sample from bare soil areas in the front or back yard (if present), and/or an additional sample from the foundation drip line. The yard and building perimeter drip line areas can be combined into a single composite sample, but the play areas should be composited as a separate sample. If there is no bare soil, soil sampling is not necessary. However, in most cases, there will be at least small bare areas that should be sampled.

Samples may be collected using a coring tool to acquire the top half inch (1 cm) of soil. Alternatively, a stainless steel scoop or the lip of the sample container may be used. Soil coring devices may not be useful in sandy, dry, or friable soil.

Each composite sample should consist of approximately equal soil subsamples collected from 3-10 distinct locations roughly equidistant from each other along an axis. For samples collected along the foundation drip line, subsamples should be collected at least 2-6 feet away from each other. At other sampling locations, samples should be collected at roughly equidistant points along each axis of an “x” shaped grid.

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

Since it is not necessary to know the lead concentration in each soil subsample, the soil standard is not divided by the number of subsamples included in the composite sample. The sample result for the soil composite sample should be compared directly to the standard, as is the case for dust.
needed. The evaluation criteria for a screen are also different (see Section V of this chapter) than those for a full risk assessment.

III. Risk Assessments for Different Size Evaluations

The scope of the risk assessment will be determined in part by the number of dwellings that need to be evaluated. For single-family, owner-occupied dwellings, the basic information that the risk assessor needs to complete a comprehensive assessment is relatively easy to collect. A short interview with the owner will provide information about resident use patterns, past maintenance practices, and the resources that the owner can devote to hazard control. However, for an evaluation of a large number of rental dwellings, the assessor must gather information from the owner about the residents, the management company (if any), and the maintenance staff in order to confidently assess the viability of various hazard control options. Therefore, the protocols for collecting information from owners of multiple dwellings are more extensive than the protocols for owner-occupants.

At the same time, owners with a large number of dwellings to be evaluated may be able to reduce the per-unit costs of the risk assessment greatly. If, in the judgment of the risk assessor, the dwellings to be evaluated are sufficiently similar, the protocols allow the risk assessor to limit sampling to the dwellings that are most likely to present immediate lead hazards to residents, as described below. The environmental sampling from these targeted similar dwellings is used to represent the lead-based paint hazards in all dwellings. For the purposes of risk assessment, the term similar dwellings describes those dwellings that were built at the same time, have a common maintenance and management history, have a common painting history, and are of similar construction. Similar dwellings do not need to be contained in a single housing development or in a single building to meet this definition; they also need not have the same number of rooms.

This section describes slightly different risk assessment protocols for the following situations:

- A assessment of an owner-occupied, single-family dwelling.
- A assessment of five or more similar rental dwellings.
- A assessment of less than five similar rental dwellings or multiple dwellings that are not similar.

Table 5.5 summarizes the key elements of a risk assessment for each category of assessment.

Like many recommendations in these Guidelines, these categories should be modified when appropriate. For example, when evaluating a duplex or three-dwelling building where one dwelling is owner-occupied, the single-family protocols should be used with some minor modifications. In large multiple-unit dwellings that are not similar, a risk assessor may be able to use dwelling selection procedures to contain costs. The selection process must be done with special care and with limitations fully described. To assist the risk assessor, standard risk assessment forms have been developed and are provided at the end of this chapter.

A. Risk Assessments for Owner-Occupied, Single-Family Dwellings

Evaluations in owner-occupied, single-family dwellings should include:

- A n interview with the homeowner about resident use patterns and potential lead hazards.
- A visual assessment of the condition of the building and painted surfaces.
- Environmental sampling of deteriorated paint, dust, and soil.

The following forms should be used in the assessment of owner-occupied, single-family dwellings:
## Table 5.5 Risk Assessment Approach For Different Size Evaluations

<table>
<thead>
<tr>
<th>Action Required</th>
<th>Owner-Occupied, Single-Family Dwellings</th>
<th>Five or More Similar Rental Dwellings</th>
<th>Less Than Five Rental Dwellings or Rental Dwellings That Are Not Similar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess every dwelling</td>
<td>Yes</td>
<td>No</td>
<td>Yes*</td>
</tr>
<tr>
<td>Deteriorated paint sampling (if no inspection conducted)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Dust sampling</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bare soil sampling</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Water sampling</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Air sampling</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Management system analysis</td>
<td>Not applicable</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Maintenance work systems modified</td>
<td>Cleaning and repair practices modified</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Housing condition and characteristics assessment</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Demographics and use patterns description</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*There may be occasions when it is not necessary to sample all nonsimilar dwellings.

- Form 5.0—Resident Questionnaire.
- Form 5.1—Building Condition Form.
- Form 5.2—Paint Conditions on Selected Surfaces.
- Form 5.3—Field Sampling Form for Deteriorated Paint (single-surface) [or Form 5.3a (composite)].
- Form 5.4—Field Sampling Form for Dust (single-surface) [or Form 5.4a (composite)].
- Form 5.5—Field Sampling Form for Soil.

### B. Risk Assessments for Five or More Similar Dwellings

Risk assessments for five or more similar dwellings should include:

- Information from the owner (or owner's representative) about the condition of the property, the age and location of children in the residence (if known), and the management and maintenance practices for the dwellings.
- The selection of dwellings for targeted sampling.
- A visual assessment of the condition of the building and painted surfaces in the targeted dwellings.
- Environmental sampling of deteriorated paint, dust, and soil in the targeted dwellings (and common areas of multifamily developments).

The following forms should be used for evaluations of five or more similar dwellings:

- Form 5.1—Building Condition Form.
1. Targeted, Worst Case, and Random Sampling

The risk assessment protocol described here uses a targeted sampling strategy. Targeted sampling selects dwellings that are most likely to contain lead-based paint hazards to represent the other dwellings based on information supplied by the owner (i.e., units are not selected randomly or on the basis of visual evidence). The sampling protocol assumes that if the selected dwellings are free of lead hazards, it is highly probable that the other similar dwellings are also free of lead hazards. Targeted sampling has been used in public housing risk assessments for several years. This sampling protocol reduces the cost of assessment and is unlikely to miss significant lead hazards.

Alternatively, similar dwellings can be evaluated with worst case sampling or random sampling. Worst case sampling requires a walk-through survey of all dwellings by the risk assessor in order to select the highest-risk dwellings based on direct visual evidence. Worst case sampling is not practical for most multiple dwellings, since it is nearly impossible to gain entry to all units in an expeditious fashion.

Some concerns have been raised about both targeted and worst case sampling, because it is not possible to quantify the degree of certainty associated with the findings as is the case for random sampling. However, if the risk assessor is conscientious about the proper selection of dwellings to be sampled (using the dwelling selection criteria) and is confident that the target dwellings meet the selection and similarity criteria, then the risk in a given development can be characterized sufficiently for the purpose of hazard control.

If the owner requires a statistically significant degree of confidence about the existence of lead-based paint hazards, random sampling should be used. Random sampling is recommended for lead-based paint inspections because the results are often used to develop more expensive, long-term hazard control measures. A full discussion of random sampling and a random sampling protocol can be found in Chapter 7. Random sampling in multifamily settings with more than 20 units usually requires more dwellings to be sampled and therefore may increase the cost of the risk assessment compared with targeted or worst case sampling.

The risk assessor must be confident that targeted dwellings meet the dwelling selection criteria defined below. Targeted sampling should not be conducted if the owner is unable to provide accurate information about the occupancy status and physical condition of the dwellings to be sampled. If it appears that this information is unavailable or is being concealed by the owner, the risk assessor should resort to random or worst case sampling. Regardless of the sampling method, if any of the sampled dwellings contain identified lead hazards, all similar dwellings should also be assumed to contain similar hazards.

Number of Dwellings To Be Sampled. Table 5.6 describes the number of dwellings that are needed for targeted sampling. Targeted sampling cannot be used for evaluations of fewer than five similar dwellings. When fewer than five similar dwellings are being evaluated, all units should be sampled. The recommendations contained in Table 5.6 are drawn in part from a public housing risk assessment/insurance program. The empirical evidence suggests that the recommended number of units sampled adequately characterizes the risk in the entire housing development (HES, 1993).
When determining the number of targeted dwellings, dwellings that are known to currently house children with elevated blood lead levels should be excluded from the total unless there are more than 10 such units, in which case they should be added to the total. Dwellings housing children with blood lead levels greater than or equal to 20 µg/dL (or a persistent 15 µg/dL upon repeated testing) require environmental investigations (CDC, 1991b) different from the procedure described here (see Chapter 16).

Each and every dwelling housing a child with an elevated blood lead level must be investigated independently. This investigation may be performed by either the local health authority or the risk assessor. If, after consultation with the health department, it is agreed that the risk assessor will perform the investigation, the evaluation should use the protocol that is described in Chapter 16 for dwellings housing children with elevated blood lead levels. This investigation should be completed in addition to the other units investigated as part of the risk assessment.

Since blood lead levels are confidential medical information, owners may not know whether children with elevated blood lead levels reside in their dwellings. Nevertheless, the risk assessor should request this information from the owner in order to try to better target the study.

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

- Dwellings cited with housing or building code violations within the past year.
- Dwellings that the owner believes are in poor condition.
- Dwellings that contain two or more children between the ages of 6 months and 6 years. (Preference should be given to dwellings housing the largest number of children.)

**Table 5.6 Minimum Number of Targeted Dwellings To Be Sampled Among Similar Dwellings**

(random sampling may require additional units)

<table>
<thead>
<tr>
<th>Number of Similar Dwellings</th>
<th>Number of Dwellings to Sample*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–4</td>
<td>All</td>
</tr>
<tr>
<td>5–20</td>
<td>4 units or 50% (whichever is greater)**</td>
</tr>
<tr>
<td>21–75</td>
<td>10 units or 20% (whichever is greater)**</td>
</tr>
<tr>
<td>76–125</td>
<td>17</td>
</tr>
<tr>
<td>126–175</td>
<td>19</td>
</tr>
<tr>
<td>176–225</td>
<td>20</td>
</tr>
<tr>
<td>226–300</td>
<td>21</td>
</tr>
<tr>
<td>301–400</td>
<td>22</td>
</tr>
<tr>
<td>401–500</td>
<td>23</td>
</tr>
<tr>
<td>501+</td>
<td>24 + 1 dwelling for each additional increment of 100 dwellings or less</td>
</tr>
</tbody>
</table>

* Does not include dwellings housing children with elevated blood lead levels.
**For percentages, round up to determine number of dwellings to be sampled.
Dwellings that serve as day-care facilities.

Dwellings prepared for reoccupancy within the past 3 months.

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

If there are a number of dwellings that all meet the same criteria, then the dwellings with the largest number of children under the age of 6 should be selected. (Children tend to cause increased wear and tear on painted surfaces; therefore, dwellings where children reside are more likely to contain leaded dust hazards.) When possible, at least one dwelling in the sample should have been recently prepared for reoccupancy (although it need not be vacant), since the repainting and other repairs that are often conducted during vacancy can create a leaded dust hazard. However, the risk assessor should not sample only dwellings that have recently been cleaned and repainted, since this would not accurately represent the conditions in the rest of the dwellings. If there are too many units that all meet the same criteria, the required number should be eliminated randomly. (See Chapter 7 for a discussion of random selection methods.) There can be many combinations of targeted dwellings that will all meet the selection criteria. The risk assessor should document which of the criteria were used to designate the dwelling as a targeted unit on the field sampling forms (Forms 5.3 (5.3a), 5.4 (5.4a), and 5.5). The “Example of Targeted Dwelling Selection” that follows shows how such a targeting system works.

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

When evaluating fewer than five similar rental dwellings or multiple dwellings that are not similar, each of the dwellings should be assessed individually. The risk assessor will not be able to draw solid conclusions from a smaller sample. Current evidence from the public housing risk assessment program suggests that hazards in different single-family, scattered-site dwelling units vary greatly (HES, 1993), unlike similar multifamily dwelling units where a clear pattern of hazards typically exists among dwellings.

Risk assessments of fewer than five similar dwellings or multiple dwellings that are not similar should include:

- The collection of information from the owner (or owner's representative) about the condition of the property, the age and location of children in residence, and the management and maintenance practices for the dwelling (optional).
- A visual assessment of the condition of the building(s) and painted surfaces of all dwellings.
- Environmental sampling of deteriorated paint, dust, and soil in all dwellings (and common areas of multifamily developments).

The following forms should be used for this type of evaluation:

- Form 5.1—Building Condition Form.
- Form 5.3—Field Sampling Form for Deteriorated Paint (single-surface) [or Form 5.3a (composite)].
- Form 5.4—Field Sampling Form for Dust (single-surface) [or Form 5.4a (composite)].
- Form 5.5—Field Sampling Form for Soil.
- Form 5.6—Management Data for Rental Dwellings.
- Form 5.7—Maintenance Data for Rental Dwellings.

1. Assessments of Five or More Dwellings That Are Not Similar

Owners of a large number of dwellings that are not similar may find the costs of a complete risk assessment daunting. These Guidelines therefore recommend that risk assessors use their professional judgment to determine whether there is a pattern of lead hazards among dwellings. If a...
clear pattern emerges, it may not be necessary to evaluate all dwellings.

The sampling method that should be employed is a modification of the targeted sampling model. Usually, it will be necessary to sample more dwellings due to increased variability. The risk assessor should collect information about the condition of the building(s) and the age and location of children in residence, and rank the dwellings based on the selection criteria. The risk assessor should then sample 25 percent of the total number of dwellings or five dwellings (whichever is greater). The first group of dwellings to be sampled should be chosen from the units thought to be at highest risk. The results should be evaluated to determine if a clear pattern of lead-based paint hazards can be discerned. If no clear pattern emerges, additional dwellings should be sampled until a pattern of hazard severity and location becomes apparent or until all dwellings have been sampled. For example, a risk assessor evaluating 100 different dwellings selects a sample of 25 targeted dwellings. The risk assessor finds that all of the targeted dwellings have high leaded dust levels in the window troughs, but nowhere else. In this situation, the risk assessor may suggest to the owner that the window troughs in all 100 dwellings are likely to be contaminated and therefore should be cleaned without further sampling. The owner must decide whether to follow this recommendation or continue the risk assessment for additional dwellings.

2. Assessments of Fewer Than Five Similar Dwellings

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

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

D. Optional Analysis of Management and Maintenance Practices

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

IV. Laboratory Analytical Procedures

A. Analytical Methods

Paint samples are to be analyzed according to the methods for total lead analysis specified in Appendix 14.1 or ASTM ES–28–94, ASTM ES–36–94 (or ES–37–94), and ASTM ES–1613–94. For risk assessment purposes, paint must not be analyzed using the Toxicity Characteristic Leading Procedure (TCLP) for hazardous waste characterization (leachable lead). All laboratories performing analyses of lead in soil, dust, and paint should be participants in EPA’s National Lead Laboratory Accreditation Program and be accredited by an organization recognized by EPA (see Chapter 2 and Appendix 14.1).
Example of Targeted Dwelling Selection

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

In this case, the risk assessor will evaluate the following:
- Five dwellings of different construction.
- One dwelling housing the child with the elevated blood lead level (see Chapter 16).
- Ten dwellings of similar construction (in Table 5.3, 24 total dwellings require 10 dwellings to be sampled).

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

For the 24 similar dwellings, the owner has provided the following information about residents:
- Six dwellings have three children under age 6.
- Three dwellings have two children under age 6.
- Five dwellings have one child under age 6.
- Nine dwellings have an unknown number of children.
- One dwelling is vacant and has recently been prepared for reoccupancy.

In addition, the owner has supplied the following resident use and maintenance information:
- Two dwellings have building code violations (one with three children, one with one child).
- Three dwellings have a history of chronic maintenance problems and are in relatively poor condition (two with an unknown number of children, one with two children).
- There are no known day-care facilities.

Based on this information, the risk assessor targets the following dwellings:
- Two dwellings with building code violations (one with three young children).
- Three dwellings rated in poor condition.
- One dwelling recently prepared for reoccupancy.

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

B. Special Quality Control Procedures for Wipe Samples

Because of inadequate digestion techniques, the use of commercial wipe media may result in low recovery rates in the laboratory (Jacobs, 1991c). Currently, no laboratory proficiency testing program manufactures durable wipe material spiked with known amounts of leaded dust. For example, the Environmental Lead Proficiency Analytical Testing (ELPAT) program supplies Whatman™ filters spiked with known amounts of leaded dust, but Whatman™ filters have not been found to be sufficiently durable in the field. Therefore, the analytical recovery results from spiked Whatman™ filters may not reflect the results for more durable wipe media. As a result, Whatman™ filters are not recommended for risk assessment or clearance sampling purposes. Risk assessors should use more durable wipe media, such as Little Ones Baby Wash Cloths™ and Little Ones Diaper Wipes™ (both manufactured for KMart), since they have been shown to exhibit recovery rates...
between 80 to 120 percent on a routine basis when spiked with leaded dust (HES, 1992). The National Institute for Occupational Safety and Health (NIOSH) has reported that Wash’n Dry™ wipes have acceptable recovery rates, although this has not been established in routine practice (NIOSH, 1993b). Other media may also have acceptable recovery rates, but must be evaluated before use. Other acceptable brands include Pure and Gentle Baby Wipes™, Walgreens Wet Wiper™, and Fame Baby Wipes™.

Laboratories can usually prepare spiked wipes upon request by risk assessors. Since there is no national proficiency program that examines laboratory performance of digestion procedures, it is necessary for risk assessors to insert spiked wipe samples with known amounts of leaded dust, at a frequency of 1 spiked wipe per 50 samples (see Appendices 13 and 14.1 for complete protocol). The laboratory should be blinded to the amount of leaded dust on each wipe. These spiked samples are in addition to spiked samples prepared by the laboratory for its internal quality control/quality assurance program. Wipe samples should be spiked with leaded dust in the range of 50–300 µg lead/wipe (generally, 100 µg/ft² is the region of interest and 1 square foot is the area usually wiped). The risk assessor should relabel (but not repackage) the spiked wipe samples so that the laboratory is as “blind” as possible to which samples are spiked samples and which samples are field samples. Repackaging will result in some loss of leaded dust from the sample. Containers for spiked samples and field samples should be identical, and both composite and single-surface wipes should be spiked. Wipes can be spiked with Urban Particulate Standard Reference Material 1648 or Powdered Lead-Based Paint Standard Reference Material 1579a, both available from the National Institute for Standards and Technology, or an equivalent “secondary” reference material, such as that used in the ELPAT program. EPA recommends that wipe samples be spiked with leaded dust, not lead in solution (EPA, 1993b).

At the present time, blind spiking is the only way for a risk assessor to judge the performance of a laboratory’s digestion procedure on commercial wipes. If the results of the blind spiked samples are within 20 percent of the actual value of lead on the wipe, then the laboratory’s performance is acceptable. If the results are outside of this range, the risk assessor should consult with the laboratory about the discrepancy. Retesting may be necessary if questions about the laboratory results cannot be resolved. Risk assessors should also record the lot number of the wipes as a way of monitoring the performance of that lot.

**V. Evaluation of Findings**

The ultimate goal of any risk assessment is to use the data gathered from the questionnaires and/or interviews, the visual inspection, and the environmental sampling to determine whether any lead-based paint hazards are present. (Hazardous levels of lead for risk assessment purposes are summarized in Table 5.7.) If lead hazards are found, the risk assessor will also identify acceptable options for controlling the hazards in each property. These options should allow the property owner to make an informed decision about what actions should be taken to protect the health of current and future residents. The risk assessor’s recommendations could include hazard control measures to correct current lead-based paint hazards, and/or new property management and maintenance policies designed to prevent hazards from occurring or recurring.

**A. Evaluating Lead-Based Paint Hazards**

Table 5.7 shows the criteria to be used for interpreting environmental samples collected during lead-based paint risk assessments.

**1. Dust**

Until EPA releases its health-based leaded dust standards (as mandated by Title X under TSCA, Title IV, Section 403), the HUD interim dust standards in Table 5.7 should be used to determine if hazardous leaded dust levels are present. These interim standards may change as a result of ongoing research. If leaded dust
samples collected by wipe sampling exceed the levels in Table 5.7, a lead-based paint hazard exists. (Even though this is technically a "dust hazard," the term "lead-based paint hazard" is used to remain consistent with the statutory definition in Title X.)

Vacuum sampling methods may also be acceptable, although each vacuum method will need its own standard. At this time HUD does not have interim standards for leaded dust using vacuum sampling.

Since the results represent all surfaces sampled, composite dust sampling results should not be divided by the number of subsamples collected.

Some State and local jurisdictions use different standards for lead-contaminated dust. At least one State (Rhode Island) measures hazardous levels of lead in dust in parts per million (known as concentration), instead of micrograms per square foot (known as loading). If it is necessary for the dwelling to pass a local lead-contaminated dust standard, the risk assessor should be familiar with the local standard and how that standard is measured. Loading is a better indicator of elevated blood lead levels and total amount of leaded dust present inside the dwelling and is easily measured by the most widespread and inexpensive method of settled dust sampling (wipe sampling). In addition, cleaning can reduce loading but not necessarily concentration. Thus, loading is the most informative measure for risk assessment and postabatement clearance purposes currently available. Vacuum sampling can determine both concentration and loading, while wipe sampling measures loading only.

For all hazard evaluations, the data should be examined to determine if consistent patterns emerge (e.g., the window troughs contain high levels, while floors and interior sills are low); such patterns will aid in the development of recommendations for focused, cost-effective control measures.

Table 5.7 Hazard Levels for Lead-Based Paint Risk Assessments

<table>
<thead>
<tr>
<th>Media</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deteriorated paint (single-surface)</td>
<td>5,000 µg/g or 1 mg/cm²</td>
</tr>
<tr>
<td>Deteriorated paint (composite)</td>
<td>5,000 µg/g or 1 mg/cm²</td>
</tr>
<tr>
<td>Dust (wipe sampling only)</td>
<td>Risk assessment</td>
</tr>
<tr>
<td>(includes both single-surface and composite)</td>
<td>Risk assessment screen (dwellings in good condition only)</td>
</tr>
<tr>
<td>Carpeted floors*</td>
<td>100 µg/ft²</td>
</tr>
<tr>
<td>Hard floors*</td>
<td>100 µg/ft²</td>
</tr>
<tr>
<td>Interior window sills</td>
<td>500 µg/ft²</td>
</tr>
<tr>
<td>Window troughs</td>
<td>800 µg/ft²</td>
</tr>
<tr>
<td>Bare soil (dwelling perimeter and yard)</td>
<td>2,000 µg/g</td>
</tr>
<tr>
<td>Bare soil (small high-contact areas, such as sandboxes and gardens)</td>
<td>400 µg/g</td>
</tr>
<tr>
<td>Water (optional)—first draw</td>
<td>15 ppb (µg/L)</td>
</tr>
</tbody>
</table>

* Whenever possible, sample hard floors, not carpets.
2. Paint

If paint contains lead equal to or greater than the following levels, it is considered to be lead-based paint under the Lead-Based Paint Poisoning Prevention Act:

- **5,000 µg/g** (also expressed as 0.5 percent, 5,000 mg/kg, or 5,000 ppm by weight). (Paint chips analyzed in the laboratory by atomic absorption spectroscopy or inductively coupled plasma emission spectroscopy will usually be reported by weight percent.)
- **1.0 mg/cm²** (XRF machines report lead content by area).

The standards may be lower (i.e., more stringent) in some State and local jurisdictions. In addition, paint that has lead just below the standard can still pose a health hazard. For example, deteriorated paint with 4,000 µg/g is more hazardous than intact paint with 5,000 µg/g of lead. Any component that contains deteriorated lead-based paint is a lead hazard and should be treated. If the amount of lead in deteriorated paint is below the regulatory limit, lead hazard control measures are not necessary to prevent exposures to lead (although paint stabilization is still recommended). Any component with deteriorated paint that is not tested and does not have a painting history similar to a tested component should be considered a lead-based paint hazard. In the event that all paint-chip samples are below the standard, the owner cannot assume that all surfaces in the dwelling are free of lead-based paint, since all surfaces were not tested. Instead, the owner can have a paint inspection performed if a surface-by-surface analysis is needed.

3. Bare Soil

EPA is also developing residential soil lead standards under Title X. Until the standard has been established, the following level of lead in soil should be considered hazardous:

- **2,000 µg/g** (bare soil only)—perimeter and yard samples.
- **400 µg/g** bare soil in small, high-contact areas (e.g., sandboxes, gardens).

A reas of bare soil that contain levels of lead that exceed 2,000 µg/g should be considered a lead hazard and should be treated accordingly. The soil standard is lower in some State and local jurisdictions. Soil that is covered with grass or other covering does not need to be treated, although the covering needs to be maintained properly. Soil in play areas is considered hazardous at even lower lead levels since children's contact will be greater. The soil standard for high-contact areas is 400 µg/g.

Risk assessors may be asked to collect soil samples before exterior abatement or interim control work for clearance purposes (see Chapter 15) to determine baseline levels. These samples may be archived and not analyzed at all unless soil levels exceed clearance standards after the hazard control work has been completed.

4. Hazard Evaluation by Targeted, Worst Case, or Random Sampling

**Dust.** When leaded dust is evaluated with targeted, worst-case, or random sampling, the risk assessor should calculate the arithmetic mean of the results for each type of component sampled (i.e., floors, interior window sills, window troughs, and carpets) by room type and entryway. If the mean leaded dust level for a component in the target dwellings equals or exceeds the dust standards described in Table 5.7, then a lead hazard has been identified for that component in all dwellings.

For example, if the mean dust level for window troughs in the targeted dwellings is 4,500 µg/ft² (above the standard of 800 µg/ft²), then all window troughs in the housing development should be considered hazardous and treated accordingly.

If the mean is below the standard, but some of the individual sample results are above the standard, those individual surfaces and all other similar surfaces should be treated. The risk assessor should attempt to identify any common characteristics of the elevated samples. Where results are ambiguous, further sampling may be needed, or the owner may decide that the cost of cleaning is less than the cost of additional
Chapter 5: Risk Assessment

5. Water

Water sampling, which is optional for a routine risk assessment, can be interpreted using the current EPA action level for lead in drinking water, which is:

- 15 ppb (15 µg/L) — drawn as a 1-liter first draw after the water has remained in the pipe for at least 6 hours.

If first-draw tap water samples exceed 15 ppb lead, the risk assessor should recommend that the homeowner contact the local water department to determine if corrosion control or other control measures are in the process of being implemented. Call the EPA Lead Information Center at 1-800-LEAD-FYI for further information on water sampling and interpretation of results. The risk assessor should inform the owner and/or resident that often the simplest way to reduce lead in drinking water is to flush the water lines by letting the cold water kitchen tap run for a minute or two whenever the water has not been used for 6 hours. This helps only if the lead is from the home's plumbing, not the service lines.

6. Other Lead Sources

If other lead sources are discovered in the dwelling, the risk assessor should contact the local health department or the local childhood lead poisoning prevention program for assistance in devising control strategies and assessing the degree of risk. For information on other sources, consult the EPA pamphlet titled, Lead-Based Paint: Protect Your Family. If it appears that a parent or other resident works in a lead industry and is bringing lead hazards into the house, the Occupational Safety and Health Administration (OSHA) can be notified anonymously by the resident. The OSHA lead standard contains important provisions to prevent workers from “taking home” occupational leaded dust.

B. Evaluating Management Policies

Except in the case of complete removal of all lead-based paint (or all components coated with lead-based paint), some type of ongoing management and maintenance of lead hazards will be required for all properties. Homeowners and owners of only a few dwellings will generally have to take on this responsibility themselves. When a risk assessor begins to describe hazard control options to these owners, it is important that the ongoing management and maintenance, monitoring, and reevaluation requirements are explained fully for each option.

For owners of larger multiple dwellings, adequate management staff may already be in place, but this new responsibility may not be understood. The owner should assign responsibility for managing the various aspects of a lead hazard control program, and the program should be described in a Lead Hazard Control Policy Statement. The Statement documents the owner's awareness of the lead hazard problem and intention to control it. In addition, the Statement authorizes a specific individual to carry out the lead hazard control plan; assigning clear responsibility to a single individual is especially important for multiple owners and property management companies. The owner (with input from the risk assessor) should determine
which employees are best positioned to conduct the following activities:

- Training and management of staff who will maintain hazard controls.
- Periodic surveillance of lead hazards and hazard controls.
- Resident reports of deteriorated paint.
- Reports of resident children with elevated blood lead levels.
- Controlled maintenance and repair work.
- Other lead-related activities or problems.

The risk assessor should recommend that the responsible individual acquire training. Often, the best person for this role is someone in authority who has received previous training and who has demonstrated concern about the issue.

The dwelling turnover process should be reviewed to determine if work practices and cleaning efforts require modification. The risk assessor should decide what types of wet cleaning and repainting efforts can be achieved safely by the owner. Environmental data gathered from dwellings recently prepared for reoccupancy should be examined to determine if hazard control measures are taking place while the dwelling is vacant (when such measures are often much easier and cheaper to complete).

As part of the management evaluation process, the risk assessor should examine the owner’s occupational safety and health program. Training is essential for maintenance personnel to ensure that they are protected and that they do not inadvertently create lead hazards in the course of their duties. If qualified, the risk assessor should determine if respirator usage (and a respirator program), a medical surveillance program, or specialized equipment (notably a HEPA vacuum) are needed. If the risk assessor is not qualified to make such judgments, the OSHA lead pamphlet should be given to the owner.

The risk assessor should help the owner decide what immediate actions to take if a child with an elevated blood lead level appears. For example, the owner should consider what options are available to house the family temporarily (e.g., in one of the owner’s lead-safe dwellings) if it appears the original dwelling may contain the source of lead. At a minimum, the owner must know where alternate housing can be found on a rapid response basis.

Some property owners perform periodic general housing quality inspections, either on turnover or on a set schedule. The risk assessor should assist the owner in developing a plan for evaluating the condition of suspected or

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**Example of a Lead Hazard Control Policy Statement**

XYZ Property Management Company is committed to controlling lead-based paint hazards in all its dwellings.

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

(Signed) ____________________________________ _______________ (Date)
(Owner)

(Signed) ____________________________________ _______________ (Date)
(Lead Hazard Control Program Manager)
known sources of lead-based paint during these routine inspections.

The risk assessor can also help a larger property owner decide which properties should be assessed first, through developing a risk assessment/hazard control plan.

C. Maintenance of Multiple Dwellings

In the course of the risk assessment, the risk assessor should determine if current maintenance practices are adequate to control lead hazards. Specifically, repainting should be performed at least every 5 years (more frequently when paint appears to be in poor condition). When repainting, the owner should be encouraged to use a lead-specific cleaner or deglossing agent to prepare the surface, and/or change to wet scraping and sanding, followed by the appropriate cleaning procedures described in Chapters 11 and 14. Specialized cleaning should always be performed following maintenance or repainting when surfaces known or suspected to contain lead-based paint are disturbed.

If the property owner uses standard work order forms, the risk assessor should determine whether they contain proper instructions about working on known or suspected lead-based painted surfaces. For example, the work orders should instruct workers when to use respirators and special cleaning measures (see Chapter 17).

The quality of the maintenance operation should also be evaluated from the prevalence of building or housing code violations, the condition of paint, and the condition of the building as rated on Form 5.1. If the building is in “poor condition,” if there have been more than two code violations over the past 2 years, or if the condition of the paint is especially poor, then the risk assessor should conclude that maintenance is deficient and that lead-based paint hazards may not be adequately managed. Such a situation requires a more frequent monitoring schedule (unless full removal is completed). See Chapter 6 for further details.

D. Lead Hazard Screen Risk Assessments in Dwellings in Good Condition

Different criteria are employed to evaluate the results of lead hazard screen risk assessments, which are limited to dwellings that are in good to fair condition. Since less data and fewer samples are collected, more stringent standards are applied to determine if a full risk assessment is needed. This helps minimize the possibility of failing to detect a lead-based paint hazard.

If the results of the composite dust or composite paint samples are greater than the levels shown in Table 5.7, a full risk assessment should be performed to determine if hazards truly exist. The screen criteria were developed by dividing the hazard standards in half for floors and window troughs. (Interior window sills should not be sampled for screening purposes.) By reducing the standards in half, the ability of the screen to detect potential lead hazards is increased.

Deteriorated paint measurements or paint-chip sample result criteria are the same as for a full risk assessment. If lead levels exceed this level, then a full risk assessment should be completed.

VI. Report

The final report compiled by the risk assessor documents the findings of the risk assessment and identified control methods. This section describes the format of such a report, as well as general guidance on how to provide control options. The hazard control chapters of these Guidelines provide further information on the various forms of lead hazard control. See Appendix 8 for two examples of risk assessment reports.

A. Site-Specific Hazard Control Options

First, the report should state whether any lead hazards were found at the dwelling. Once the nature, severity, and location of identified lead hazards are understood, the risk assessor should inform the owner of the range of acceptable hazard control measures. These control
### Table 5.8 Main Hazard Control Options That Could Be Identified in Risk Assessments

<table>
<thead>
<tr>
<th>Treatment Option</th>
<th>Dust(^1) on Floor</th>
<th>Dust(^1) on Windows</th>
<th>Paint(^2) on Doors</th>
<th>Paint(^2) on Windows</th>
<th>Paint(^2) on Floor and Walls</th>
<th>Paint(^2) on Trim</th>
<th>High Soil Lead Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust removal</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Paint film stabilization</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Friction reduction treatments</td>
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<td></td>
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<tr>
<td>Impact reduction treatments</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Planting grass</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planting sod</td>
<td>X</td>
<td></td>
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<td></td>
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<tr>
<td>Paving the soil</td>
<td>X</td>
<td></td>
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<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Encapsulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Enclosure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Paint removal by heat gun(^3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paint removal by chemical(^3)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paint removal by contained abrasive(^3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil removal</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building component replacement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Lead-contaminated dust.
2. Deteriorated lead-based paint.
3. Limited areas only.
measures range from various short-term interim controls (e.g., specialized cleaning, minor wet scraping, and repainting) to long-term abatement methods (e.g., building component replacement, enclosure, and paint removal). Table 5.8 lists the major options and scenarios, although the number of possibilities and combinations is virtually unlimited. For example, if the risk assessor finds that window troughs are highly contaminated with leaded dust and deteriorated lead-based paint, but the owner has very limited resources, dust removal and paint film stabilization would be the most appropriate course of action. However, if more resources are available, the entire window should be replaced.

**1. Education**

The risk assessor also has a special role to play in educating the various parties involved in lead poisoning prevention. Title X specifically states that lead hazard control efforts should include education, since it is critical to the success of any interim control or abatement plan. This includes education for management and maintenance staff and residents. While the risk assessor cannot be expected to train and educate everyone, some simple steps can and should be taken in the process of developing the final report.

**Management Staff Education.** While meeting with the owner or property manager to describe the lead hazard control options available, the risk assessor can help educate them on the seriousness of lead hazards. The EPA lead hazard information pamphlet or other local literature should be handed out (usually available at no charge to the risk assessor or owner from the National Lead Information Center).

**Maintenance Staff.** The risk assessor should inform the owner of the OSHA Lead Standard requirements as they apply to maintenance workers who may be involved in repair work on surfaces coated with lead-based paint and the employer’s obligation to train those workers (see Chapter 9).

**Residents.** The risk assessor should also take every opportunity to educate residents on what they can do to reduce their exposure to lead-based paint hazards. The EPA lead hazard information brochure can be helpful here and can be obtained by calling 1–800–LEAD–FYI. Information on local childhood lead poisoning prevention programs and blood lead screening services should also be provided.

**B. Cost and Feasibility**

**1. Cost**

Each owner will have a different level of available funding. Some will be able to make a long-term investment that will require a large capital outlay, but will be less expensive in the long run, adding to the value of the property. Others will be unable to make this type of investment and will opt for short-term measures that require smaller initial outlays and more frequent monitoring. The risk assessor should endeavor to provide information that will permit the owner to make an informed decision on this complex issue. The owner, not the risk assessor, must make the final decision. Costs for various treatments vary considerably from one locale to the next and are also subject to market conditions, making it difficult to provide firm cost figures. However, the risk assessor should provide a very rough estimate of cost for each control option based on local conditions. Cost estimates can be provided on either a dwelling-unit basis or a building-component basis.

**2. Feasibility**

In addition to cost, the risk assessor should identify treatments that are unlikely to be effective, such as:

- Repainting or encapsulating an area of deteriorated paint caused by moisture problems (leaky roof, poor vapor barrier, uncorrected plumbing problem, window air conditioner, etc.) without correcting the moisture problem first.
- Repainting or encapsulating an area subject to impact and friction.
- Repainting or encapsulating deteriorated paint or varnish without preparing the surface first.