Chapter DHS 163

APPENDIX H

PROTECTING OCCUPANTS

Chapter 8, HUD Guidelines for the Evaluation and Control of Lead–Based Paint Hazards in Housing

www.hud.gov/offices/lead/lbp/hudguidelines/Ch08.pdf

Step–by–Step Summary
Resident Protection and Worksite Preparation: How To Do It

1. If possible, perform the work in a vacant unit. If residents must remain inside the dwelling during work, erect appropriate barrier systems as described in the tables in this chapter.
2. Permit residents to reenter the work area only after work is complete and visual inspection has been completed and dust samples collected. If the work is not completed at the end of the day, keep the barriers in place overnight and instruct residents not to enter the work area.
3. Determine if the dwelling will require precleaning before worksite containment. If the paint is severely deteriorated and there are paint chips present, the paint chips should be removed by HEPA vacuuming before plastic is laid down.
4. Determine requirements for relocation, isolation of work areas, and other worksite preparation measures based on the type and extent of the work and the amount of dust that will be generated.
5. Select an Interior Worksite Preparation Level, an Exterior Worksite Preparation Level, and/or a Window Worksite Preparation Level (depending on the work required) from the tables in this chapter.
6. Conduct daily cleanup.
7. Perform a visual examination daily.
8. Conduct dust sampling as specified in this chapter.
9. Never permit residents to enter a work area where lead hazard control work is under way. Entry should be denied until cleaning and clearance have been completed.

Chapter 8: Resident Protection and Worksite Preparation

I. Introduction

Lead hazard control methods generate varying amounts of leaded dust, paint chips, and other lead–contaminated materials. This chapter describes ways to protect residents and the environment from exposure to, or contamination from, these materials. Some processes require complete isolation of the work area and/or full evacuation of the residents and their belongings, while other methods require little or no containment. Containment refers to various methods of preventing leaded dust from migrating beyond the work area. It includes everything from the simple use of disposable plastic drop cloths to the sealing of openings with plastic sheeting. The required degree of containment depends upon a number of considerations (e.g., type of hazard control, resident relocation possibilities, size of work area, etc.). Generally speaking, significant lead hazard control work should be performed in vacant units, with only small–scale activity conducted in occupied units. Worksite preparation is needed for both interim control and abatement work.

This chapter describes the general principles behind resident protection and proper worksite preparation. Three tables are included: one for interior work, one for exterior work, and one for windows. Guidance is also offered for certified abatement supervisors, risk assessors, and project planners on the development of a written occupant protection plan, which may be required by some agencies.

II. Resident Entry Into Work Area Prohibited

Regardless of the extent of the work, *residents must never be permitted to enter the work area while work is under way, even if the work only disturbs a small area. Resident reentry into the work area is permitted only after the area has been cleaned and has passed clearance*. All of the work–site preparation strategies discussed in this chapter are based on this fundamental requirement. While residents may not be present inside the work area, it is possible for them to remain inside other parts of the dwelling during some types of work, or to leave for the day and return to the dwelling at night after cleaning and visual evaluation, and collection of dust samples. In cases of hardship where the resident *must* occupy the area prior to receiving laboratory results of clearance dust samples, occupancy should not occur until visual inspection has been completed and dust samples collected.

III. Site Assessment and Precleaning

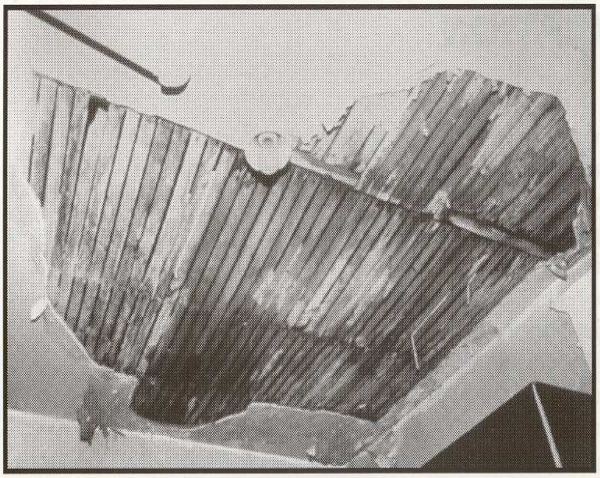
The certified lead hazard control supervisor should ensure that the dwelling is structurally sound. If structural deficiencies exist, they must be corrected before the site can be prepared for lead hazard control (see Figure 8.1). Environmental and worker protection must be provided if the structural repairs will involve disturbance of surfaces coated with lead–based paint.

If the paint is severely deteriorated and there are numerous paint chips on the floors, the paint chips should be removed by high–efficiency particulate air (HEPA) vacuuming before any plastic is laid down (see Figure 8.2). Vacuuming will prevent the paint chips from being ground into dust by the workers' feet. Wet washing usually is not required for precleaning.

IV. Debris Control

The only way that lead hazard control work can proceed safely in *occupied dwellings* is to ensure that cleaning is completed before residents reenter the unit. Cleaning is especially important when residents are present in the dwelling while work is in progress, or when residents return in the evening after work has been completed for the day. Neither debris nor plastic sheeting may be left outside the dwelling overnight or in any area where passersby or children could come into contact with these materials. All debris must be handled in accordance with the standards outlined in Chapter 10. When residents cannot be relocated and work must proceed room by room, clearance standards may be more difficult to meet, since dust from moved furniture may cause recontamination.

Figure 8.1 Repair Structural Deficiencies at the Beginning of Lead Hazard Control.



V. Worksite Preparation Levels

A. Worksite Preparation Level Selection

When planning a lead hazard control job, the worksite preparation levels listed in Tables 8.1, 8.2, and 8.3 should be considered. Since each worksite is unique, it is necessary to pick the level that is the most cost–effective for each specific situation. This judgment should be made by a certified risk assessor, a certified abatement supervisor, or a trained lead–based paint planner/designer. The tables provide guidance on choosing the appropriate preparation level for each job.

The necessary worksite preparation level will depend on:

* The size of the surface(s) needing work.

* The type of hazard control methods to be used.

* The extent of existing contamination.

* The building layout.

* The vacancy status of the dwelling.

* The types of worker protection needed.

* The need for other construction or abatement work (e.g., renovation or asbestos abatement).

A certified individual should weigh all of these issues in determining which level of preparation is appropriate for a given situation. For example, the enclosure of walls will probably require a lower worksite preparation level than the wet scraping of a large area, since enclosure will generate less dust. Similarly, deteriorated component replacement (demolition work) will probably require a higher containment level than the wet scraping of a small area.

These *Guidelines* are performance–oriented and are not specifications. It is possible to select elements from different worksite preparation levels to devise a unique worksite preparation plan for an individual dwelling. Whatever combination of containment measures is selected, the levels of leaded dust outside the containment area must not rise above clearance levels. Containment measures should be designed to prevent the release of leaded dust, which can be spread by workers' shoes or by airborne dust. A previously conducted risk assessment will indicate if hazardous leaded dust levels exist outside the containment area. If such a problem was identified and if leaded dust levels rise in the course of the work, it is reasonable to conclude that the dust was released from the containment area and that the containment system is ineffective. Dust sampling is usually conducted no further than 10 feet away from the containment area. If deviations from the worksite preparation plans described below are contemplated, then the performance of the containment system should be determined by a certified risk assessment professional. This flexibility per-

mits owners to select the most cost–effective strategy, while also protecting the public health and the environment.

B. Hazard Control Work in Occupied Dwellings

If bathrooms are not accessible, residents should always be relocated during the day (Table 8.1, Level 2 at a minimum) unless alternative arrangements can be made (e.g., use of a neighbor's bathroom). In addition, if construction will result in other hazards (such as exposed electric wires), then residents should also be relocated.

If a worksite preparation level is selected that permits residents either to remain inside the dwelling while work is being conducted or return to the dwelling in the evening after work has been completed, then a dust sample should be collected from the living area at greatest risk of contamination (usually the living area adjacent to the work area) at the end of each work day. It is essential that the sample be collected *before* the work area is cleaned to determine if the containment system protected the occupants that day. If the leaded dust level is above clearance standards, residents must be relocated immediately and must not be allowed to reenter the dwelling until cleanup and documented compliance with clearance standards is achieved.

If the same work crew and supervisor can document compliance with these criteria for three or more consecutive dwelling units using the same hazard control techniques, then dust sampling frequency can be reduced to 1 in every 20 dwellings for that crew.

C. Worksite Preparation Level Definitions

Tables 8.1 and 8.2 define interior and exterior worksite preparation levels. There are four levels for the preparation of dwelling interiors and three levels for the preparation of dwelling exteriors. The lowest levels are primarily designed for interim control activities, while the highest levels are designed for the dustiest abatement methods. Table 8.3 describes worksite preparation as it applies specifically to windows (this technique could be performed from either the interior or exterior of the dwelling). The plastic sheeting in the tables refers to polyethylene plastic sheeting that is at least 6 mils thick (or equivalent). These recommendations represent the best guidance that can be offered at this time. Worksite preparation levels should be designed on a site–by–site basis.

Figure 8.2 Area Should Be Precleaned and Structural Deficiencies in Flooring Repaired Before Lead Hazard Control Begins.

Figure 8.3a Prepare the Worksite With Plastic Sheeting (interior).

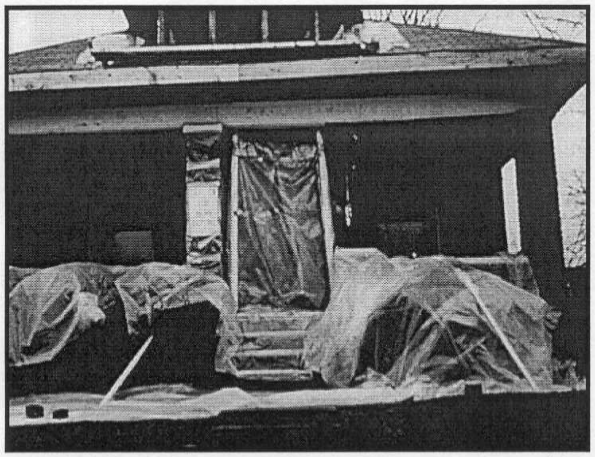


Figure 8.3b Prepare the Worksite With Plastic Sheeting (exterior).

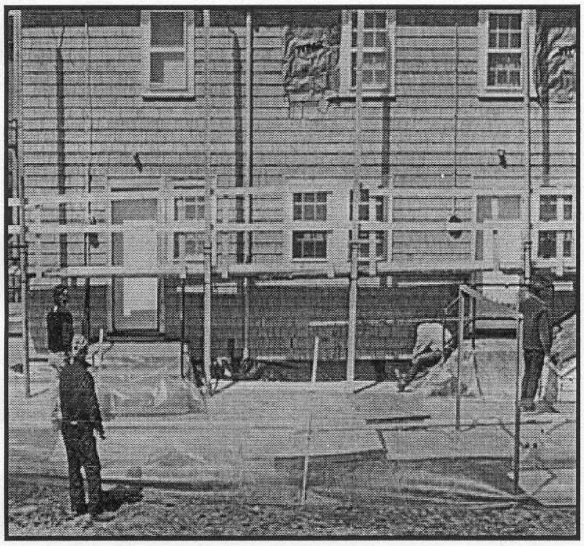


Figure 8.3c Prepare the Worksite (exterior).

VI. Relocation Dwellings

Relocation dwellings should be acceptable to residents so that they will not attempt to return to their own dwellings during lead hazard control work. Dwellings serving as temporary relocation units must be lead safe. In addition, these units should be adequately equipped with furniture, cooking facilities, refrigerators, televisions, and toys (unless these items will be moved with the resident). Relocation is usually a substantial undertaking, involving not only the movement of people and their possessions, but also the coordination of mail, phone, school, and community changes. Whenever possible, children should continue to attend the same school during the relocation period, even though this may involve finding special transportation. Due to their complex nature, relocation considerations may dictate the scheduling of the project.

VII. Negative Pressure Zones ("Negative Air" Machines)

In asbestos abatement work and lead–based paint removal work on structural steel, it is common to create work sites that are under negative pressure in comparison to the outside of the containment structure. A negative pressure zone is usually created by blowing air out of the work area through a HEPA filter, while air intake is restricted to a lower flow rate than exhaust. This process causes air to leak *into* the containment area instead of *out* of the containment area, and reduces dust fall and worker exposure by removing contaminants from the airstream through constant filtration.

Due to the different aerodynamics of leaded dust particles and asbestos fibers, negative pressure zones do not appear to be necessary for most forms of residential lead hazard control work. No effect on airborne lead levels, either inside or outside the containment area, has been associated with the use of an air filtration device commonly known as a "negative air" machine (NIOSH, 1993a). In addition, no effect on cleanup efficiency was noted. Most lead–based paint abatement projects in the public housing program have not found it necessary to use negative air machines. Therefore, the added expense of requiring negative pressure zones for general residential lead–based paint hazard control work does not appear to be justified. However, there are two specific situations where the use of a negative pressure zone would be appropriate in a residential setting.

The first case involves floor sanding. Even if the paint has already been removed, leaded dust generation is likely to be quite high due to residual dust in the flooring. Enclosing old flooring with new flooring is the recommended course of action. However, if old flooring must be restored, then negative pressure zones should be established. At least 10 air changes per hour should be provided and all exhaust air must be passed through a HEPA filter.

Secondly, the practice of abrasive blasting is likely to produce extremely high levels of airborne leaded dust (NIOSH, 1992a) and should not be permitted in housing since other methods are readily available. One report indicated that the exterior sandblasting of a school resulted in 27,100 μg/g of lead in the soil at a

nearby residence, and nearly 100,000 μg/g in the soil at the school (Peace, 1983). If for some reason abrasive blasting without local exhaust ventilation is performed on the interior of a dwelling, a full containment structure with HEPA filtration and adequate airflow should be required. Such a containment system would also be necessary if the exterior of a dwelling was blasted, usually resulting in "tenting" an entire building (i.e., erecting a temporary tent–like structure around a building or one face of a building).

For nearly all types of lead hazard control work, windows should be kept closed to prevent dust and chips from leaving the unit. If volatile chemicals will be used, adequate ventilation must be provided, either by opening windows during the use of the chemicals or by supplying air through a HEPA air handling machine.

Figure 8.4 Apply a Second Layer of Plastic.

Figure 8.5 Cover the Air Vents With Plastic After Turning Off the HVAC System.

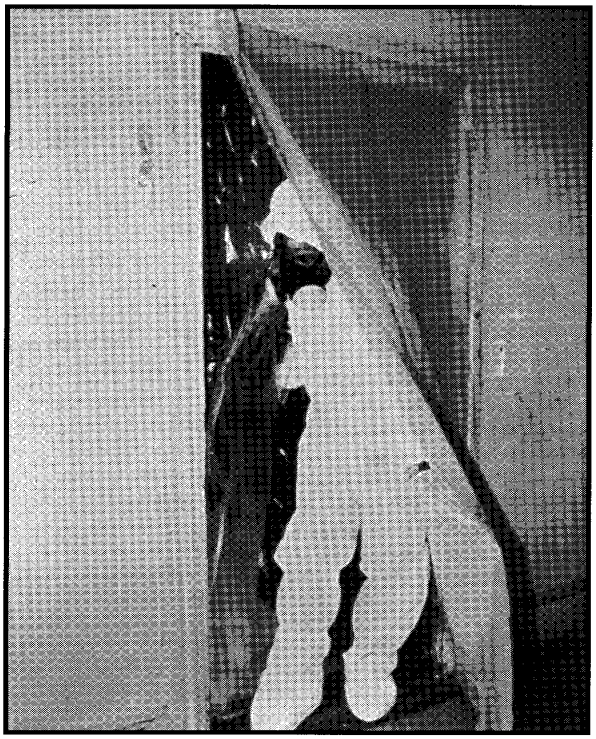


Figure 8.6 Install a Simple Airlock Over a Doorway to Minimize Lead Dust Migration.

Table 8.1
Interior Worksite Preparation Levels (Not Including Windows)

Description	Level 1	Level 2	Level 3	Level 4
Typical Applications (Hazard Controls	Dust removal and any abatement or interim control method disturbing no more than 2 square feet of painted surface per room.	Any interim control or abatement method disturbing between 2 and 10 square feet of painted surface per room.	Same as Level 2	Any interim control or abatement method disturbing more than 10 square feet per room
Time Limit Per Dwelling	One work day.	One work day.	Five work days.	None.
Resident Location	Inside dwelling, but outside work area. Resident must have lead–safe passage to bathroom, at least one living area, and entry/egress pathways. Alternatively, resident can leave the dwelling during the work day.	Same as Level 1.	Outside the dwelling; but can return in evening after day's work and cleanup are completed. Resident must have safe passage to bathroom, at least one living area, and entry/egress path ways upon return. Alternatively, resident can leave until all work is completed.	Outside the dwelling for duration of project; cannot return until clearance has been achieved.
Containment and Barrier System	Single layer of plastic sheeting on floor extending 5 feet beyond the perimeter of the treated area in all directions. No plastic sheeting on doorways is required, but a low physical barrier (furniture, wood planking) to prevent inadvertent access by resident is recommended. Children should not have access to plastic sheeting (suffocation hazard).	Two layers of plastic on entire floor. Plastic sheet with primitive airlock flap on all door–ways. Doors secured from inside the work area need not be sealed. Children should not have access to plastic sheeting (suffocation hazard).	Two layers of plastic on entire floor. Plastic sheet with primitive airlock flap on all doorways to work areas. Doors secured from inside the work area need not be sealed. Overnight barrier should be locked or firmly secured. Children should not have access to plastic sheeting (suffocation hazard).	Two layers of plastic on entire floor. If entire unit is being treated, cleaned, and cleared, individual room doorways need not be sealed. If only a few rooms are being treated, seal all doorways with primitive airlock flap to avoid cleaning entire dwelling. Doors secured from inside the work area need not be sealed.
Warning Signs	Required at entry to room but not on building (unless exterior work is also under way).	Same as Level 1.	Posted at main and secondary entryways, since resident will not be present to answer the door.	Posted at building exterior near main and secondary entryways.

Table 8.1 – Continued
Interior Worksite Preparation Levels (Not Including Windows)

Description	Level 1	Level 2	Level 3	Level 4
Ventilation System	Dwelling ventilation system turned off, but vents need not be sealed with plastic if they are more than 5 feet away from the surface being treated. Negative pressure zones (with "negative air" machines) are not required, unless large supplies of fresh air must be admitted into the work area to control exposures to other hazardous substances (for example, solvent vapors).	Turned off and all vents in room sealed with plastic. Negative pressure zones (with "negative air" machines) are not required, unless large supplies of fresh air must be admitted into the work area to control exposure to other hazardous substances (for example, solvent vapors).	Same as Level 2.	Same as Level 2.
Furniture	Left in place uncovered if furniture is more than 5 feet from working surface. If within 5 feet, furniture should be sealed with a single layer of plastic or moved for paint treatment. No covering is required for dust removal.	Removed from work area. Large items that cannot be moved can be sealed with a single layer of plastic sheeting and left in work area.	Same as Level 2.	Same as Level 2.
Cleanup (See Chapter 14 for further discussion of cleanup methods)	HEPA vacuum, wet wash, and HEPA vacuum all surfaces and floors extending 5 feet in all directions from the treated surface. For dust removal work alone, a HEPA vacuum and wet wash cycle is adequate (i.e., no second pass with a HEPA vacuum is needed). Also wet wash and HEPA vacuum floor in adjacent area(s) used as pathway to work area. Do not store debris inside dwelling overnight; transfer to a locked secure area at the end of each day.	HEPA vacuum, wet wash, and HEPA vacuum all surfaces in room. Also wet wash and HEPA vacuum floor in adjacent area(s) used as pathway to work area. Do not store debris inside dwelling overnight; use a secure locked area.	Remove top layer of plastic from floor and discard. Keep bottom layer of plastic on floor for use on the next day. HEPA vacuum, wet wash, and HEPA vacuum all surfaces in room. Also wet wash and HEPA vacuum floor in adjacent area(s) used as pathway to work area. Do not store debris inside dwelling overnight; use a secure locked area.	Full HEPA vacuum, wet wash, and HEPA vacuum cycle, as detailed in Chapter 14.
Dust Sampling	Clearance only.	Clearance only.	One sample collected outside work area every few jobs plus clearance.	Clearance only.

Note: Primitive air locks are constructed using two sheets of plastic. The first one is taped on the top, the floor, and two sides of doorway. Next, cut a slit about 6 feet high down the middle of the plastic; do not cut the slit all the way down to the floor. Tape the second sheet of plastic across the top of the door only, so that it acts as a flap. The flap should open into the work area. See Figure 8.6.

Table 8.2
Exterior Worksite Preparation Levels (Not Including Windows)

Description	Level 1	Level 2	Level 3
Typical Applications	Any interim control or abatement method disturbing less than 10 square feet of exterior painted surface per dwelling. Also includes soil control work.	Any interim control or abatement method disturbing 10 to 50 square feet of exterior painted surface per dwelling. Also includes soil control work.	Any interim control or abatement method disturbing more than 50 square feet of exterior painted surface per dwelling. Also includes soil control work.
Time Limit Per Dwelling	One day.	None.	None.
Containment and Barrier System	One layer of plastic on ground extending 10 feet beyond the perimeter of working surfaces. Do not anchor ladder feet on top of plastic (puncture the plastic to anchor ladders securely to ground). For all other exterior plastic surfaces, protect plastic with boards to prevent puncture from falling debris, nails, etc., if necessary. Raise edges of plastic to create a basin to prevent contaminated runoff in the event of unexpected precipitation. Secure plastic to side of building with tape or other anchoring system (no gaps between plastic and building). Weight all plastic sheets down with two–by–fours or similar objects. Keep all windows within 20 feet of working surfaces closed, including windows of adjacent structures.	Same as Level 1.	Same as Level 1.
Resident Location	Inside dwelling but outside work area for duration of project until cleanup has been completed. Alternatively, resident can leave until all work has been completed. Resident must have lead–safe access to entry/egress pathways.	Relocated from dwelling during workday, but may return after daily cleanup has been completed.	Relocated from dwelling for duration of project until final clearance is achieved.

Table 8.2 – Continued
Exterior Worksite Preparation Levels (Not Including Windows)

Description	Level 1	Level 2	Level 3
Playground Equipment, Toys, Sandbox	Remove all movable items to a 20–foot distance from working surfaces. Items that cannot be readily moved to a 20–foot distance can be sealed with taped plastic sheeting.	Same as Level 1.	Same as Level 1.
Security	Erect temporary fencing or barrier tape at a 20–foot perimeter around working surfaces (or less if distance to next building or sidewalk is less than 20 feet). If an entryway is within 10 feet of working surfaces, require use of alternative entryway. If practical, install vertical containment to prevent exposure. Use a locked dumpster, covered truck, or locked room to store debris before disposal.	Same as Level 1.	Same as Level 1.
Signs	Post warning signs on the building and at a 20–foot perimeter around building (or less if distance to next building or sidewalk is less than 20 feet).	Same as Level 1.	Same as Level 1.
Weather	Do not conduct work if wind speeds are greater than 20 miles per hour. Work must stop and cleanup must occur before rain begins.	Same as Level 1.	Same as Level 1.
Cleanup (See Chapter 14)	Do not leave debris or plastic out overnight if work is not completed. Keep all debris in secured area until final disposal.	Same as Level 1.	Same as Level 1.
Porches	One lead–safe entryway must be made available to residents at all times. Do not treat front and rear porches at the same time if there is not a third doorway.	Front and rear porches can be treated at the same time, unless unprotected workers must use the entryway.	Same as Level 2.

Table 8.3
Window Treatment or Replacement Worksite Preparation

Appropriate Applications	Any window treatment or replacement
Resident Location	Remain inside dwelling but outside work area until project has been completed. Alternatively, can leave until all work has been completed. Resident must have access to lead–safe entry/egress pathway.
Time Limit Per Dwelling	None.
Containment and Barrier System	One layer of plastic sheeting on ground or floor extending 5 feet beyond perimeter of window being treated/replaced. Two layers of plastic taped to interior wall if working on window from outside; if working from the inside, tape two layers of plastic to exterior wall. If working from inside, implement a minimum Interior Worksite Preparation Level 2. Children cannot be present in an interior room where plastic sheeting is located due to suffocation hazard. Do not anchor ladder feet on top of plastic (puncture the plastic to anchor ladders securely to ground). For all other exterior plastic surfaces, protect plastic with boards to prevent puncture from falling debris, nails, etc. (if necessary). Secure plastic to side of building with tape or other anchoring system (no gaps between plastic and building). Weigh all plastic sheets down with two–by–fours or similar objects. All windows in dwelling should be kept closed. All windows in adjacent dwellings that are closer than 20 feet to the work area should be kept closed.
Signs	Post warning signs on the building and at a 20–foot perimeter around building (or less if distance to next building or sidewalk is less than 20 feet). If window is to be removed from inside, no exterior sign is necessary.
Security	Erect temporary fencing or barrier tape at a 20–foot perimeter around building (or less if distance to next building or sidewalk is less than 20 feet). Use a locked dumpster, covered truck, or locked room to store debris before disposal.
Weather	Do not conduct work if wind speeds are greater than 20 miles per hour. Work must stop and cleanup must occur before rain begins, or work should proceed from the inside only.
Playground Equipment, Toys, Sandbox	Removed from work area and adjacent areas. Remove all items to a 20–foot distance from dwelling. Large, unmovable items can be sealed with taped plastic sheeting.
Cleaning	If working from inside, HEPA vacuum, wet wash, and HEPA vacuum all interior surfaces within 10 feet of work area in all directions. If working from the exterior, no cleaning of the interior is needed, unless the containment is breached. Similarly, no cleaning is needed on the exterior if all work is done on the interior and the containment is not breached. If containment is breached, then cleaning on both sides of the window should be performed. No debris or plastic should be left out overnight if work is not completed. All debris must be kept in a secure area until final disposal.