Lead Supervisor Refresher Handouts Booklet

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LEAD-BASED PAINT HANDOUTS

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Part XI

Environmental Protection Agency

40 CFR Part 745

Lead; Requirements for Lead-Based Paint Activities in Target Housing and Child-Occupied Facilities; Final Rule

45777

§ 745.220 Scope and applicability.

(a) This subpart contains procedures and requirements for the accreditation of training programs for lead-based paint activities and renovations, procedures and requirements for the certification of individuals and firms engaged in lead-based paint activities, and work practice standards for performing such activities. This subpart also requires that, except as discussed below, all lead-based paint activities, as defined in this subpart, be performed by certified individuals and firms.

(b) This subpart applies to all individuals and firms who are engaged in lead-based paint activities as defined in § 745.223, except persons who perform these activities within residential dwellings that they own, unless the residential dwelling is occupied by a person or persons other than the owner or the owner's immediate family while these activities are being performed, or a child residing in the building has been identified as having an elevated blood lead level. This subpart applies only in those States or Indian Country that do not have an authorized State or Tribal program pursuant to § 745.324 of subpart Q.

(c) Each department, agency, and instrumentality of the executive, legislative, and judicial branches of the Federal Government having jurisdiction over any property or facility, or engaged in any activity resulting, or which may result, in a lead-based paint hazard, and each officer, agent, or employee thereof shall be subject to, and comply with, all Federal, State, interstate, and local requirements, both substantive and procedural, including the requirements of this subpart regarding lead-based paint, lead-based paint activities, and lead-based paint hazards.

(d) While this subpart establishes specific requirements for performing lead-based paint activities should they be undertaken, nothing in this subpart requires that the owner or occupant undertake any particular lead-based paint activity.

[61 FR 45813, Aug. 29, 1996, as amended at 73 FR 21766, Apr. 22, 2008]

§ 745.223 Definitions.

The definitions in subpart A apply to this subpart. In addition, the following definitions apply.

Abatement means any measure or set of measures designed to permanently eliminate lead-based paint hazards. Abatement includes, but is not limited to:

(1) The removal of paint and dust, the permanent enclosure or encapsulation of lead-based paint, the replacement of painted surfaces or fixtures, or the removal or permanent covering of soil, when lead-based paint hazards are present in such paint, dust or soil; and

(2) All preparation, cleanup, disposal, and post-abatement clearance testing activities associated with such measures.

(3) Specifically, abatement includes, but is not limited to:

(i) Projects for which there is a written contract or other documentation, which provides that an individual or firm will be conducting activities in or to a residential dwelling or child-occupied facility that:

(A) Shall result in the permanent elimination of lead-based paint hazards; or

(B) Are designed to permanently eliminate lead-based paint hazards and are described in paragraphs (1) and (2) of this definition.

(ii) Projects resulting in the permanent elimination of lead-based paint hazards, conducted by firms or individuals certified in accordance with § 745.226, unless such projects are covered by paragraph (4) of this definition;

(iii) Projects resulting in the permanent elimination of lead-based paint hazards, conducted by firms or individuals who, through their company name or promotional literature, represent, advertise, or hold themselves out to be in the business of performing lead-based paint activities as identified and defined by this section, unless such projects are covered by paragraph (4) of this definition; or

(iv) Projects resulting in the permanent elimination of lead-based paint hazards, that are conducted in response to State or local abatement orders.

(4) Abatement does not include renovation, remodeling, landscaping or other activities, when such activities are not designed to permanently eliminate lead-based paint hazards, but, instead, are designed to repair, restore, or remodel a given structure or dwelling, even though these activities may incidentally result in a reduction or elimination of lead-based paint hazards. Furthermore, abatement does not include interim controls, operations and maintenance activities, or other measures and activities designed to temporarily, but not permanently, reduce lead-based paint hazards.

Accredited training program means a training program that has been accredited by EPA pursuant to § 745.225 to provide training for individuals engaged in lead-based paint activities.

Adequate quality control means a plan or design which ensures the authenticity, integrity, and accuracy of samples, including dust, soil, and paint chip or paint film samples. Adequate quality control also includes provisions for representative sampling.

Business day means Monday through Friday with the exception of Federal holidays.

Certified firm means a company, partnership, corporation, sole proprietorship, association, or other business entity that performs lead-based paint activities to which EPA has issued a certificate of approval pursuant to § 745.226(f).

Certified inspector means an individual who has been trained by an accredited training program, as defined by this section, and certified by EPA pursuant to § 745.226 to conduct inspections. A certified inspector also samples for the presence of lead in dust and soil for the purposes of abatement clearance testing.

Certified abatement worker means an individual who has been trained by an accredited training program, as defined by this section, and certified by EPA pursuant to § 745.226 to perform abatements.

Certified project designer means an individual who has been trained by an accredited training program, as defined by this section, and certified by EPA pursuant to § 745.226 to prepare abatement project designs, occupant protection plans, and abatement reports.

Certified risk assessor means an individual who has been trained by an accredited training program, as defined by this section, and certified by EPA pursuant to § 745.226 to conduct risk assessments. A risk assessor also samples for the presence of lead in dust and soil for the purposes of abatement clearance testing.

Certified supervisor means an individual who has been trained by an accredited training program, as defined by this section, and certified by EPA pursuant to § 745.226 to supervise and conduct abatements, and to prepare occupant protection plans and abatement reports.

Child-occupied facility means a building, or portion of a building, constructed prior to 1978, visited regularly by the same child, 6 years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Child-occupied facilities may include, but are not limited to, day-care centers, preschools and kindergarten classrooms.

Clearance levels are values that indicate the maximum amount of lead permitted in dust on a surface following completion of an abatement activity.

Common area means a portion of a building that is generally accessible to all occupants. Such an area may include, but is not limited to, hallways, stairways, laundry and recreational rooms, playgrounds, community centers, garages, and boundary fences.

Component or building component means specific design or structural elements or fixtures of a building, residential dwelling, or child-occupied facility that are distinguished from each other by form, function, and location. These include, but are not limited to, interior components such as: ceilings, crown molding, walls, chair rails, doors, door trim, floors, fireplaces, radiators and other heating units, shelves, shelf supports, stair treads, stair risers, stair stringers, newel posts, railing caps, balustrades, windows and trim (including sashes, window heads, jambs, sills or stools and troughs), built in cabinets, columns, beams, bathroom vanities, counter tops, and air conditioners; and exterior components such as: painted roofing, chimneys, flashing, gutters and downspouts, ceilings, soffits, fascias, rake boards, cornerboards, bulkheads, doors and door trim, fences, floors, joists, lattice work, railings and railing caps, siding, handrails, stair risers and treads, stair stringers, columns, balustrades, window sills or stools and troughs, casings, sashes and wells, and air conditioners.

Containment means a process to protect workers and the environment by controlling exposures to the lead-contaminated dust and debris created during an abatement.

Course agenda means an outline of the key topics to be covered during a training course, including the time allotted to teach each topic.

Course test means an evaluation of the overall effectiveness of the training which shall test the trainees' knowledge and retention of the topics covered during the course.

Course test blue print means written documentation identifying the proportion of course test questions devoted to each major topic in the course curriculum.

Deteriorated paint means paint that is cracking, flaking, chipping, peeling, or otherwise separating from the substrate of a building component.

Discipline means one of the specific types or categories of lead-based paint activities identified in this subpart for which individuals may receive training from accredited programs and become certified by EPA. For example, “abatement worker” is a discipline.

Distinct painting history means the application history, as indicated by its visual appearance or a record of application, over time, of paint or other surface coatings to a component or room.

Documented methodologies are methods or protocols used to sample for the presence of lead in paint, dust, and soil.

Elevated blood lead level (EBL) means an excessive absorption of lead that is a confirmed concentration of lead in whole blood of 20 µg/dl (micrograms of lead per deciliter of whole blood) for a single venous test or of 15-19 µg/dl in two consecutive tests taken 3 to 4 months apart.

Encapsulant means a substance that forms a barrier between lead-based paint and the environment using a liquid-applied coating (with or without reinforcement materials) or an adhesively bonded covering material.

Encapsulation means the application of an encapsulant.

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

Guest instructor means an individual designated by the training program manager or principal instructor to provide instruction specific to the lecture, hands-on activities, or work practice components of a course.

Hands-on skills assessment means an evaluation which tests the trainees' ability to satisfactorily perform the work practices and procedures identified in § 745.225(d), as well as any other skill taught in a training course.

Hazardous waste means any waste as defined in 40 CFR 261.3.

Inspection means a surface-by-surface investigation to determine the presence of lead-based paint and the provision of a report explaining the results of the investigation.

Interim certification means the status of an individual who has successfully completed the appropriate training course in a discipline from an accredited training program, as defined by this section, but has not yet received formal certification in that discipline from EPA pursuant to § 745.226. Interim certifications expire 6 months after the completion of the training course, and is equivalent to a certificate for the 6-month period.

Interim controls means a set of measures designed to temporarily reduce human exposure or likely exposure to lead-based paint hazards, including specialized cleaning, repairs, maintenance, painting, temporary containment, ongoing monitoring of lead-based paint hazards or potential hazards, and the establishment and operation of management and resident education programs.

Lead-based paint means paint or other surface coatings that contain lead equal to or in excess of 1.0 milligrams per square centimeter or more than 0.5 percent by weight.

Lead-based paint activities means, in the case of target housing and child-occupied facilities, inspection, risk assessment, and abatement, as defined in this subpart.

Lead-based paint activities courses means initial and refresher training courses (worker, supervisor, inspector, risk assessor, project designer) provided by accredited training programs.

Lead-based paint hazard means any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, or lead-contaminated paint that is deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects as identified by the Administrator pursuant to TSCA section 403.

Lead-hazard screen is a limited risk assessment activity that involves limited paint and dust sampling as described in § 745.227(c).

Living area means any area of a residential dwelling used by one or more children age 6 and under, including, but not limited to, living rooms, kitchen areas, dens, play rooms, and children's bedrooms.

Local government means a county, city, town, borough, parish, district, association, or other public body (including an agency comprised of two or more of the foregoing entities) created under State law.

Multi-family dwelling means a structure that contains more than one separate residential dwelling unit, which is used or occupied, or intended to be used or occupied, in whole or in part, as the home or residence of one or more persons.

Nonprofit means an entity which has demonstrated to any branch of the Federal Government or to a State, municipal, tribal or territorial government, that no part of its net earnings inure to the benefit of any private shareholder or individual.

Paint in poor condition means more than 10 square feet of deteriorated paint on exterior components with large surface areas; or more than 2 square feet of deteriorated paint on interior components with large surface areas (e.g., walls, ceilings, floors, doors); or more than 10 percent of the total surface area of the component is deteriorated on interior or exterior components with small surface areas (window sills, baseboards, soffits, trim).

Permanently covered soil means soil which has been separated from human contact by the placement of a barrier consisting of solid, relatively impermeable materials, such as pavement or concrete. Grass, mulch, and other landscaping materials are not considered permanent covering.

Person means any natural or judicial person including any individual, corporation, partnership, or association; any Indian Tribe, State, or political subdivision thereof; any interstate body; and any department, agency, or instrumentality of the Federal government.

Principal instructor means the individual who has the primary responsibility for organizing and teaching a particular course.

Recognized laboratory means an environmental laboratory recognized by EPA pursuant to TSCA section 405(b) as being capable of performing an analysis for lead compounds in paint, soil, and dust.

Reduction means measures designed to reduce or eliminate human exposure to lead-based paint hazards through methods including interim controls and abatement.

Residential dwelling means (1) a detached single family dwelling unit, including attached structures such as porches and stoops; or (2) a single family dwelling unit in a structure that contains more than one separate residential dwelling unit, which is used or occupied, or intended to be used or occupied, in whole or in part, as the home or residence of one or more persons.

Risk assessment means (1) an on-site investigation to determine the existence, nature, severity, and location of lead-based paint hazards, and (2) the provision of a report by the individual or the firm conducting the risk assessment, explaining the results of the investigation and options for reducing lead-based paint hazards.

Start date means the first day of any lead-based paint activities training course or lead-based paint abatement activity.

Start date provided to EPA means the start date included in the original notification or the most recent start date provided to EPA in an updated notification.

State means any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, the Canal Zone, American Samoa, the Northern Mariana Islands, or any other territory or possession of the United States.

Target housing means any housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any one or more children age 6 years or under resides or is expected to reside in such housing for the elderly or persons with disabilities) or any 0-bedroom dwelling.

Training curriculum means an established set of course topics for instruction in an accredited training program for a particular discipline designed to provide specialized knowledge and skills.

Training hour means at least 50 minutes of actual learning, including, but not limited to, time devoted to lecture, learning activities, small group activities, demonstrations, evaluations, and/or hands-on experience.

Training manager means the individual responsible for administering a training program and monitoring the performance of principal instructors and guest instructors.

Training provider means any organization or entity accredited under § 745.225 to offer lead-based paint activities courses.

Visual inspection for clearance testing means the visual examination of a residential dwelling or a child-occupied facility following an abatement to determine whether or not the abatement has been successfully completed.

Visual inspection for risk assessment means the visual examination of a residential dwelling or a child-occupied facility to determine the existence of deteriorated lead-based paint or other potential sources of lead-based paint hazards.

[61 FR 45813, Aug. 29, 1996, as amended at 64 FR 31097, June 9, 1999; 66 FR 1239, Jan. 5, 2001; 69 FR 18495, Apr. 8, 2004]

§ 745.225 Accreditation of training programs: target housing and child occupied facilities.

(a) *Scope.* (1) A training program may seek accreditation to offer courses in any of the following disciplines: Inspector, risk assessor, supervisor, project designer, abatement worker, renovator, and dust sampling technician. A training program may also seek accreditation to offer refresher courses for each of the above listed disciplines.

(2) Training programs may first apply to EPA for accreditation of their lead-based paint activities courses or refresher courses pursuant to this section on or after August 31, 1998. Training programs may first apply to EPA for accreditation of their renovator or dust sampling technician courses or refresher courses pursuant to this section on or after April 22, 2009.

(3) A training program must not provide, offer, or claim to provide EPA- accredited lead-based paint activities courses without applying for and receiving accreditation from EPA as required under paragraph (b) of this section on or after March 1, 1999. A training program must not provide, offer, or claim to provide EPA-accredited renovator or dust sampling technician courses without applying for and receiving accreditation from EPA as required under paragraph (b) of this section on or after June 23, 2008.

(b) *Application process.* The following are procedures a training program must follow to receive EPA accreditation to offer lead-based paint activities courses, renovator courses, or dust sampling technician courses:

(1) A training program seeking accreditation shall submit a written application to EPA containing the following information:

(i) The training program's name, address, and telephone number.

(ii) A list of courses for which it is applying for accreditation. For the purposes of this section, courses taught in different languages and electronic learning courses are considered different courses, and each must independently meet the accreditation requirements.

(iii) The name and documentation of the qualifications of the training program manager.

(iv) The name(s) and documentation of qualifications of any principal instructor(s).

(v) A statement signed by the training program manager certifying that the training program meets the requirements established in paragraph (c) of this section. If a training program uses EPA-recommended model training materials, or training materials approved by a State or Indian Tribe that has been authorized by EPA under subpart Q of this part, the training program manager shall include a statement certifying that, as well.

(vi) If a training program does not use EPA-recommended model training materials, its application for accreditation shall also include:

(A) A copy of the student and instructor manuals, or other materials to be used for each course.

(B) A copy of the course agenda for each course.

(C) When applying for accreditation of a course in a language other than English, a signed statement from a qualified, independent translator that they had compared the course to the English language version and found the translation to be accurate.

(vii) All training programs shall include in their application for accreditation the following:

(A) A description of the facilities and equipment to be used for lecture and hands-on training.

(B) A copy of the course test blueprint for each course.

(C) A description of the activities and procedures that will be used for conducting the assessment of hands-on skills for each course.

(D) A copy of the quality control plan as described in paragraph (c)(9) of this section.

(2) If a training program meets the requirements in paragraph (c) of this section, then EPA shall approve the application for accreditation no more than 180 days after receiving a complete application from the training program. In the case of approval, a certificate of accreditation shall be sent to the applicant. In the case of disapproval, a letter describing the reasons for disapproval shall be sent to the applicant. Prior to disapproval, EPA may, at its discretion, work with the applicant to address inadequacies in the application for accreditation. EPA may also request additional materials retained by the training program under paragraph (i) of this section. If a training program's application is disapproved, the program may reapply for accreditation at any time.

(3) A training program may apply for accreditation to offer courses or refresher courses in as many disciplines as it chooses. A training program may seek accreditation for additional courses at any time as long as the program can demonstrate that it meets the requirements of this section.

(4) A training program applying for accreditation must submit the appropriate fees in accordance with § 745.238.

(c) *Requirements for the accreditation of training programs.* For a training program to obtain accreditation from EPA to offer lead-based paint activities courses, renovator courses, or dust sampling technician courses, the program must meet the following requirements:

(1) The training program shall employ a training manager who has:

(i) At least 2 years of experience, education, or training in teaching workers or adults; or

(ii) A bachelor's or graduate degree in building construction technology, engineering, industrial hygiene, safety, public health, education, business administration or program management or a related field; or

(iii) Two years of experience in managing a training program specializing in environmental hazards; and

(iv) Demonstrated experience, education, or training in the construction industry including: Lead or asbestos abatement, painting, carpentry, renovation, remodeling, occupational safety and health, or industrial hygiene.

(2) The training manager shall designate a qualified principal instructor for each course who has:

(i) Demonstrated experience, education, or training in teaching workers or adults; and

(ii) Successfully completed at least 16 hours of any EPA-accredited or EPA-authorized State or Tribal-accredited lead-specific training for instructors of lead-based paint activities courses or 8 hours of any EPA-accredited or EPA-authorized State or Tribal-accredited lead-specific training for instructors of renovator or dust sampling technician courses; and

(iii) Demonstrated experience, education, or training in lead or asbestos abatement, painting, carpentry, renovation, remodeling, occupational safety and health, or industrial hygiene.

(3) The principal instructor shall be responsible for the organization of the course, course delivery, and oversight of the teaching of all course material. The training manager may designate guest instructors as needed for a portion of the course to provide instruction specific to the lecture, hands-on activities, or work practice components of a course. However, the principal instructor is primarily responsible for teaching the course materials and must be present to provide instruction (or oversight of portions of the course taught by guest instructors) for the course for which he has been designated the principal instructor.

(4) The following documents shall be recognized by EPA as evidence that training managers and principal instructors have the education, work experience, training requirements or demonstrated experience, specifically listed in paragraphs (c)(1) and (c)(2) of this section. This documentation must be submitted with the accreditation application and retained by the training program as required by the recordkeeping requirements contained in paragraph (i) of this section. Those documents include the following:

(i) Official academic transcripts or diploma as evidence of meeting the education requirements.

(ii) Resumes, letters of reference, or documentation of work experience, as evidence of meeting the work experience requirements.

(iii) Certificates from train-the-trainer courses and lead-specific training courses, as evidence of meeting the training requirements.

(5) The training program shall ensure the availability of, and provide adequate facilities for, the delivery of the lecture, course test, hands-on training, and assessment activities. This includes providing training equipment that reflects current work practices and maintaining or updating the equipment and facilities as needed.

(6) To become accredited in the following disciplines, the training program shall provide training courses that meet the following training requirements:

(i) The inspector course shall last a minimum of 24 training hours, with a minimum of 8 hours devoted to hands-on training activities. The minimum curriculum requirements for the inspector course are contained in paragraph (d)(1) of this section.

(ii) The risk assessor course shall last a minimum of 16 training hours, with a minimum of 4 hours devoted to hands-on training activities. The minimum curriculum requirements for the risk assessor course are contained in paragraph (d)(2) of this section.

(iii) The supervisor course shall last a minimum of 32 training hours, with a minimum of 8 hours devoted to hands-on activities. The minimum curriculum requirements for the supervisor course are contained in paragraph (d)(3) of this section.

(iv) The project designer course shall last a minimum of 8 training hours. The minimum curriculum requirements for the project designer course are contained in paragraph (d)(4) of this section.

(v) The abatement worker course shall last a minimum of 16 training hours, with a minimum of 8 hours devoted to hands-on training activities. The minimum curriculum requirements for the abatement worker course are contained in paragraph (d)(5) of this section.

(vi) The renovator course must last a minimum of 8 training hours, with a minimum of 2 hours devoted to hands-on training activities. The minimum curriculum requirements for the renovator course are contained in paragraph (d)(6) of this section.

(vii) The dust sampling technician course must last a minimum of 8 training hours, with a minimum of 2 hours devoted to hands-on training activities. The minimum curriculum requirements for the dust sampling technician course are contained in paragraph (d)(7) of this section.

(viii) Electronic learning and other alternative course delivery methods are permitted for the classroom portion of renovator, dust sampling technician, or lead-based paint activities courses but not the hands-on portion of these courses, or for final course tests or proficiency tests described in paragraph (c)(7) of this section. Electronic learning courses must comply with the following requirements:

(A) A unique identifier must be assigned to each student for them to use to launch and re-launch the course.

(B) The training provider must track each student's course log-ins, launches, progress, and completion, and maintain these records in accordance with paragraph (i) of this section.

(C) The course must include periodic knowledge checks equivalent to the number and content of the knowledge checks contained in EPA's model course, but at least 16 over the entire course. The knowledge checks must be successfully completed before the student can go on to the next module.

(D) There must be a test of at least 20 questions at the end of the electronic learning portion of the course, of which 80% must be answered correctly by the student for successful completion of the electronic learning portion of the course. The test must be designed so that students to do not receive feedback on their test answers until after they have completed and submitted the test.

(E) Each student must be able to save or print a copy of an electronic learning course completion certificate. The electronic certificate must not be susceptible to easy editing.

(7) For each course offered, the training program shall conduct either a course test at the completion of the course, and if applicable, a hands-on skills assessment, or in the alternative, a proficiency test for that discipline. Each student must successfully complete the hands-on skills assessment and receive a passing score on the course test to pass any course, or successfully complete a proficiency test.

(i) The training manager is responsible for maintaining the validity and integrity of the hands-on skills assessment or proficiency test to ensure that it accurately evaluates the trainees' performance of the work practices and procedures associated with the course topics contained in paragraph (d) of this section.

(ii) The training manager is responsible for maintaining the validity and integrity of the course test to ensure that it accurately evaluates the trainees' knowledge and retention of the course topics.

(iii) The course test shall be developed in accordance with the test blueprint submitted with the training accreditation application.

(8) The training program shall issue unique course completion certificates to each individual who passes the training course. The course completion certificate shall include:

(i) The name, a unique identification number, and address of the individual.

(ii) The name of the particular course that the individual completed.

(iii) Dates of course completion/test passage.

(iv) For initial inspector, risk assessor, project designer, supervisor, or abatement worker course completion certificates, the expiration date of interim certification, which is 6 months from the date of course completion.

(v) The name, address, and telephone number of the training program.

(vi) The language in which the course was taught.

(vii) For renovator and dust sampling technician course completion certificates, a photograph of the individual. The photograph must be an accurate and recognizable image of the individual. As reproduced on the certificate, the photograph must not be smaller than 1 square inch.

(9) The training manager shall develop and implement a quality control plan. The plan shall be used to maintain and improve the quality of the training program over time. This plan shall contain at least the following elements:

(i) Procedures for periodic revision of training materials and the course test to reflect innovations in the field.

(ii) Procedures for the training manager's annual review of principal instructor competency.

(10) Courses offered by the training program must teach the work practice standards contained in § 745.85 or § 745.227, as applicable, in such a manner that trainees are provided with the knowledge needed to perform the renovations or lead-based paint activities they will be responsible for conducting.

(11) The training manager shall be responsible for ensuring that the training program complies at all times with all of the requirements in this section.

(12) The training manager shall allow EPA to audit the training program to verify the contents of the application for accreditation as described in paragraph (b) of this section.

(13) The training manager must provide notification of renovator, dust sampling technician, or lead-based paint activities courses offered.

(i) The training manager must provide EPA with notification of all renovator, dust sampling technician, or lead-based paint activities courses offered. The original notification must be received by EPA at least 7 business days prior to the start date of any renovator, dust sampling technician, or lead-based paint activities course.

(ii) The training manager must provide EPA updated notification when renovator, dust sampling technician, or lead-based paint activities courses will begin on a date other than the start date specified in the original notification, as follows:

(A) For renovator, dust sampling technician, or lead-based paint activities courses beginning prior to the start date provided to EPA, an updated notification must be received by EPA at least 7 business days before the new start date.

(B) For renovator, dust sampling technician, or lead-based paint activities courses beginning after the start date provided to EPA, an updated notification must be received by EPA at least 2 business days before the start date provided to EPA.

(iii) The training manager must update EPA of any change in location of renovator, dust sampling technician, or lead-based paint activities courses at least 7 business days prior to the start date provided to EPA.

(iv) The training manager must update EPA regarding any course cancellations, or any other change to the original notification. Updated notifications must be received by EPA at least 2 business days prior to the start date provided to EPA.

(v) Each notification, including updates, must include the following:

(A) Notification type (original, update, cancellation).

(B) Training program name, EPA accreditation number, address, and telephone number.

(C) Course discipline, type (initial/refresher), and the language in which instruction will be given.

(D) Date(s) and time(s) of training.

(E) Training location(s) telephone number, and address.

(F) Principal instructor's name.

(G) Training manager's name and signature.

(vi) Notification must be accomplished using any of the following methods: Written notification, or electronically using the Agency's Central Data Exchange (CDX). Written notification of lead-based paint activities course schedules can be accomplished by using either the sample form titled “Lead-Based Paint Training Notification” or a similar form containing the information required in paragraph (c)(13)(v) of this section. All written notifications must be delivered to EPA by U.S. Postal Service, fax, commercial delivery service, or hand delivery (persons submitting notification by U.S. Postal Service are reminded that they should allow 3 additional business days for delivery in order to ensure that EPA receives the notification by the required date). Instructions and sample forms can be obtained from the NLIC at 1-800-424-LEAD(5323), or on the Internet at *http://www.epa.gov/lead.* Hearing- or speech-impaired persons may reach the above telephone number through TTY by calling the toll-free Federal Relay Service at 1-800-877-8339.

(vii) Renovator, dust sampling technician, or lead-based paint activities courses must not begin on a date, or at a location other than that specified in the original notification unless an updated notification identifying a new start date or location is submitted, in which case the course must begin on the new start date and/or location specified in the updated notification.

(viii) No training program shall provide renovator, dust sampling technician, or lead-based paint activities courses without first notifying EPA of such activities in accordance with the requirements of this paragraph.

(14) The training manager must provide notification following completion of renovator, dust sampling technician, or lead-based paint activities courses.

(i) The training manager must provide EPA notification after the completion of any lead-based paint activities course. This notice must be received by EPA no later than 10 business days following course completion.

(ii) The notification must include the following:

(A) Training program name, EPA accreditation number, address, and telephone number.

(B) Course discipline and type (initial/refresher).

(C) Date(s) of training.

(D) The following information for each student who took the course:

(*1*) Name.

(*2*) Address.

(*3*) Date of birth.

(*4*) Course completion certificate number.

(*5*) Course test score.

(*6*) For renovator or dust sampling technician courses, a digital photograph of the student.

(E) Training manager's name and signature.

(iii) Notification must be accomplished using any of the following methods: Written notification, or electronically using the Agency's Central Data Exchange (CDX). Written notification following renovator, dust sampling technician, or lead-based paint activities training courses can be accomplished by using either the sample form titled “Lead-Based Paint Training Course Follow-up” or a similar form containing the information required in paragraph (c)(14)(ii) of this section. All written notifications must be delivered to EPA by U.S. Postal Service, fax, commercial delivery service, or hand delivery (persons submitting notification by U.S. Postal Service are reminded that they should allow 3 additional business days for delivery in order to ensure that EPA receives the notification by the required date). Instructions and sample forms can be obtained from the NLIC at 1-800-424-LEAD (5323), or on the Internet at *http://www.epa.gov/lead.*

(d) *Minimum training curriculum requirements.* To become accredited to offer lead-based paint courses in the specific disciplines listed in this paragraph, training programs must ensure that their courses of study include, at a minimum, the following course topics.

(1) *Inspector.* Instruction in the topics described in paragraphs (d)(1)(iv), (v), (vi), and (vii) of this section must be included in the hands-on portion of the course.

(i) Role and responsibilities of an inspector.

(ii) Background information on lead and its adverse health effects.

(iii) Background information on Federal, State, and local regulations and guidance that pertains to lead-based paint and lead- based paint activities.

(iv) Lead-based paint inspection methods, including selection of rooms and components for sampling or testing.

(v) Paint, dust, and soil sampling methodologies.

(vi) Clearance standards and testing, including random sampling.

(vii) Preparation of the final inspection report.

(viii) Recordkeeping.

(2) *Risk assessor.* Instruction in the topics described in paragraphs (d)(2)(iv), (vi), and (vii) of this section must be included in the hands-on portion of the course.

(i) Role and responsibilities of a risk assessor.

(ii) Collection of background information to perform a risk assessment.

(iii) Sources of environmental lead contamination such as paint, surface dust and soil, water, air, packaging, and food.

(iv) Visual inspection for the purposes of identifying potential sources of lead-based paint hazards.

(v) Lead hazard screen protocol.

(vi) Sampling for other sources of lead exposure.

(vii) Interpretation of lead-based paint and other lead sampling results, including all applicable Federal or State guidance or regulations pertaining to lead-based paint hazards.

(viii) Development of hazard control options, the role of interim controls, and operations and maintenance activities to reduce lead-based paint hazards.

(ix) Preparation of a final risk assessment report.

(3) *Supervisor.* Instruction in the topics described in paragraphs (d)(3)(v), (vii), (viii), (ix), and (x) of this section must be included in the hands-on portion of the course.

(i) Role and responsibilities of a supervisor.

(ii) Background information on lead and its adverse health effects.

(iii) Background information on Federal, State, and local regulations and guidance that pertain to lead-based paint abatement.

(iv) Liability and insurance issues relating to lead-based paint abatement.

(v) Risk assessment and inspection report interpretation.

(vi) Development and implementation of an occupant protection plan and abatement report.

(vii) Lead-based paint hazard recognition and control.

(viii) Lead-based paint abatement and lead-based paint hazard reduction methods, including restricted practices.

(ix) Interior dust abatement/cleanup or lead-based paint hazard control and reduction methods.

(x) Soil and exterior dust abatement or lead-based paint hazard control and reduction methods.

(xi) Clearance standards and testing.

(xii) Cleanup and waste disposal.

(xiii) Recordkeeping.

(4) *Project designer.* (i) Role and responsibilities of a project designer.

(ii) Development and implementation of an occupant protection plan for large-scale abatement projects.

(iii) Lead-based paint abatement and lead-based paint hazard reduction methods, including restricted practices for large-scale abatement projects.

(iv) Interior dust abatement/cleanup or lead hazard control and reduction methods for large-scale abatement projects.

(v) Clearance standards and testing for large scale abatement projects.

(vi) Integration of lead-based paint abatement methods with modernization and rehabilitation projects for large scale abatement projects.

(5) *Abatement worker.* Instruction in the topics described in paragraphs (d)(5)(iv), (v), (vi), and (vii) of this section must be included in the hands-on portion of the course.

(i) Role and responsibilities of an abatement worker.

(ii) Background information on lead and its adverse health effects.

(iii) Background information on Federal, State and local regulations and guidance that pertain to lead-based paint abatement.

(iv) Lead-based paint hazard recognition and control.

(v) Lead-based paint abatement and lead-based paint hazard reduction methods, including restricted practices.

(vi) Interior dust abatement methods/cleanup or lead-based paint hazard reduction.

(vii) Soil and exterior dust abatement methods or lead-based paint hazard reduction.

(6) *Renovator.* Instruction in the topics described in paragraphs (d)(6)(iv), (vi), (vii), and (viii) of this section must be included in the hands-on portion of the course.

(i) Role and responsibility of a renovator.

(ii) Background information on lead and its adverse health effects.

(iii) Background information on EPA, HUD, OSHA, and other Federal, State, and local regulations and guidance that pertains to lead-based paint and renovation activities.

(iv) Procedures for using acceptable test kits to determine whether paint is lead-based paint.

(v) Procedures for collecting a paint chip sample and sending it to a laboratory recognized by EPA under section 405(b) of TSCA.

(vi) Renovation methods to minimize the creation of dust and lead-based paint hazards.

(vii) Interior and exterior containment and cleanup methods.

(viii) Methods to ensure that the renovation has been properly completed, including cleaning verification and clearance testing.

(ix) Waste handling and disposal.

(x) Providing on-the-job training to other workers.

(xi) Record preparation.

(7) *Dust sampling technician.* Instruction in the topics described in paragraphs (d)(6)(iv) and (vi) of this section must be included in the hands-on portion of the course.

(i) Role and responsibility of a dust sampling technician.

(ii) Background information on lead and its adverse health effects.

(iii) Background information on Federal, State, and local regulations and guidance that pertains to lead-based paint and renovation activities.

(iv) Dust sampling methodologies.

(v) Clearance standards and testing.

(vi) Report preparation.

(e) *Requirements for the accreditation of refresher training programs.* A training program may seek accreditation to offer refresher training courses in any of the following disciplines: Inspector, risk assessor, supervisor, project designer, abatement worker, renovator, and dust sampling technician. To obtain EPA accreditation to offer refresher training, a training program must meet the following minimum requirements:

(1) Each refresher course shall review the curriculum topics of the full-length courses listed under paragraph (d) of this section, as appropriate. In addition, to become accredited to offer refresher training courses, training programs shall ensure that their courses of study include, at a minimum, the following:

(i) An overview of current safety practices relating to lead-based paint in general, as well as specific information pertaining to the appropriate discipline.

(ii) Current laws and regulations relating to lead-based paint in general, as well as specific information pertaining to the appropriate discipline.

(iii) Current technologies relating to lead-based paint in general, as well as specific information pertaining to the appropriate discipline.

(2) Refresher courses for inspector, risk assessor, supervisor, and abatement worker must last a minimum of 8 training hours. Refresher courses for project designer, renovator, and dust sampling technician must last a minimum of 4 training hours. Refresher courses for all disciplines except project designer must include a hands-on component.

(3) Except for project designer courses, for all other courses offered, the training program shall conduct a hands-on assessment, and at the completion of the course, a course test.

(4) A training program may apply for accreditation of a refresher course concurrently with its application for accreditation of the corresponding training course as described in paragraph (b) of this section. If so, EPA shall use the approval procedure described in paragraph (b) of this section. In addition, the minimum requirements contained in paragraphs (c)(1) through (c)(5) and (c)(7) through (c)(14), and (e)(1),through (e)(3) of this section shall also apply.

(5) A training program seeking accreditation to offer refresher training courses only shall submit a written application to EPA containing the following information:

(i) The refresher training program's name, address, and telephone number.

(ii) A list of courses for which it is applying for accreditation.

(iii) The name and documentation of the qualifications of the training program manager.

(iv) The name(s) and documentation of the qualifications of the principal instructor(s).

(v) A statement signed by the training program manager certifying that the refresher training program meets the minimum requirements established in paragraph (c) of this section, except for the requirements in paragraph (c)(6) of this section. If a training program uses EPA-developed model training materials, or training materials approved by a State or Indian Tribe that has been authorized by EPA under § 745.324 to develop its refresher training course materials, the training manager shall include a statement certifying that, as well.

(vi) If the refresher training course materials are not based on EPA-developed model training materials, the training program's application for accreditation shall include:

(A) A copy of the student and instructor manuals to be used for each course.

(B) A copy of the course agenda for each course.

(vii) All refresher training programs shall include in their application for accreditation the following:

(A) A description of the facilities and equipment to be used for lecture and hands-on training.

(B) A copy of the course test blueprint for each course.

(C) A description of the activities and procedures that will be used for conducting the assessment of hands-on skills for each course (if applicable).

(D) A copy of the quality control plan as described in paragraph (c)(9) of this section.

(viii) The requirements in paragraphs (c)(1) through (c)(5), and (c)(7) through (c)(14) of this section apply to refresher training providers.

(ix) If a refresher training program meets the requirements listed in this paragraph, then EPA shall approve the application for accreditation no more than 180 days after receiving a complete application from the refresher training program. In the case of approval, a certificate of accreditation shall be sent to the applicant. In the case of disapproval, a letter describing the reasons for disapproval shall be sent to the applicant. Prior to disapproval, EPA may, at its discretion, work with the applicant to address inadequacies in the application for accreditation. EPA may also request additional materials retained by the refresher training program under paragraph (i) of this section. If a refresher training program's application is disapproved, the program may reapply for accreditation at any time.

(f) *Re-accreditation of training programs.* (1) Unless re-accredited, a training program's accreditation, including refresher training accreditation, shall expire 4 years after the date of issuance. If a training program meets the requirements of this section, the training program shall be reaccredited.

(2) A training program seeking re-accreditation shall submit an application to EPA no later than 180 days before its accreditation expires. If a training program does not submit its application for re-accreditation by that date, EPA cannot guarantee that the program will be re-accredited before the end of the accreditation period.

(3) The training program's application for re-accreditation shall contain:

(i) The training program's name, address, and telephone number.

(ii) A list of courses for which it is applying for re-accreditation.

(iii) The name and qualifications of the training program manager.

(iv) The name(s) and qualifications of the principal instructor(s).

(v) A description of any changes to the training facility, equipment or course materials since its last application was approved that adversely affects the students' ability to learn.

(vi) A statement signed by the program manager stating:

(A) That the training program complies at all times with all requirements in paragraphs (c) and (e) of this section, as applicable; and

(B) The recordkeeping and reporting requirements of paragraph (i) of this section shall be followed.

(vii) A payment of appropriate fees in accordance with § 745.238.

(4) Upon request, the training program shall allow EPA to audit the training program to verify the contents of the application for re-accreditation as described in paragraph (f)(3) of this section.

(g) *Suspension, revocation, and modification of accredited training programs.* (1) EPA may, after notice and an opportunity for hearing, suspend, revoke, or modify training program accreditation, including refresher training accreditation, if a training program, training manager, or other person with supervisory authority over the training program has:

(i) Misrepresented the contents of a training course to EPA and/or the student population.

(ii) Failed to submit required information or notifications in a timely manner.

(iii) Failed to maintain required records.

(iv) Falsified accreditation records, instructor qualifications, or other accreditation-related information or documentation.

(v) Failed to comply with the training standards and requirements in this section.

(vi) Failed to comply with Federal, State, or local lead-based paint statutes or regulations.

(vii) Made false or misleading statements to EPA in its application for accreditation or re-accreditation which EPA relied upon in approving the application.

(2) In addition to an administrative or judicial finding of violation, execution of a consent agreement in settlement of an enforcement action constitutes, for purposes of this section, evidence of a failure to comply with relevant statutes or regulations.

(h) *Procedures for suspension, revocation or modification of training program accreditation.* (1) Prior to taking action to suspend, revoke, or modify the accreditation of a training program, EPA shall notify the affected entity in writing of the following:

(i) The legal and factual basis for the suspension, revocation, or modification.

(ii) The anticipated commencement date and duration of the suspension, revocation, or modification.

(iii) Actions, if any, which the affected entity may take to avoid suspension, revocation, or modification, or to receive accreditation in the future.

(iv) The opportunity and method for requesting a hearing prior to final EPA action to suspend, revoke or modify accreditation.

(v) Any additional information, as appropriate, which EPA may provide.

(2) If a hearing is requested by the accredited training program, EPA shall:

(i) Provide the affected entity an opportunity to offer written statements in response to EPA's assertions of the legal and factual basis for its proposed action, and any other explanations, comments, and arguments it deems relevant to the proposed action.

(ii) Provide the affected entity such other procedural opportunities as EPA may deem appropriate to ensure a fair and impartial hearing.

(iii) Appoint an official of EPA as Presiding Officer to conduct the hearing. No person shall serve as Presiding Officer if he or she has had any prior connection with the specific matter.

(3) The Presiding Officer appointed pursuant to paragraph (h)(2) of this section shall:

(i) Conduct a fair, orderly, and impartial hearing within 90 days of the request for a hearing.

(ii) Consider all relevant evidence, explanation, comment, and argument submitted.

(iii) Notify the affected entity in writing within 90 days of completion of the hearing of his or her decision and order. Such an order is a final agency action which may be subject to judicial review.

(4) If EPA determines that the public health, interest, or welfare warrants immediate action to suspend the accreditation of any training program prior to the opportunity for a hearing, it shall:

(i) Notify the affected entity of its intent to immediately suspend training program accreditation for the reasons listed in paragraph (g)(1) of this section. If a suspension, revocation, or modification notice has not previously been issued pursuant to paragraph (g)(1) of this section, it shall be issued at the same time the emergency suspension notice is issued.

(ii) Notify the affected entity in writing of the grounds for the immediate suspension and why it is necessary to suspend the entity's accreditation before an opportunity for a suspension, revocation or modification hearing.

(iii) Notify the affected entity of the anticipated commencement date and duration of the immediate suspension.

(iv) Notify the affected entity of its right to request a hearing on the immediate suspension within 15 days of the suspension taking place and the procedures for the conduct of such a hearing.

(5) Any notice, decision, or order issued by EPA under this section, any transcripts or other verbatim record of oral testimony, and any documents filed by an accredited training program in a hearing under this section shall be available to the public, except as otherwise provided by section 14 of TSCA or by 40 CFR part 2. Any such hearing at which oral testimony is presented shall be open to the public, except that the Presiding Officer may exclude the public to the extent necessary to allow presentation of information which may be entitled to confidential treatment under section 14 of TSCA or 40 CFR part 2.

(6) The public shall be notified of the suspension, revocation, modification or reinstatement of a training program's accreditation through appropriate mechanisms.

(7) EPA shall maintain a list of parties whose accreditation has been suspended, revoked, modified or reinstated.

(i) *Training program recordkeeping requirements.* (1) Accredited training programs shall maintain, and make available to EPA, upon request, the following records:

(i) All documents specified in paragraph (c)(4) of this section that demonstrate the qualifications listed in paragraphs (c)(1) and (c)(2) of this section of the training manager and principal instructors.

(ii) Current curriculum/course materials and documents reflecting any changes made to these materials.

(iii) The course test blueprint.

(iv) Information regarding how the hands-on assessment is conducted including, but not limited to:

(A) Who conducts the assessment.

(B) How the skills are graded.

(C) What facilities are used.

(D) The pass/fail rate.

(v) The quality control plan as described in paragraph (c)(9) of this section.

(vi) Results of the students' hands-on skills assessments and course tests, and a record of each student's course completion certificate.

(vii) Any other material not listed in paragraphs (i)(1)(i) through (i)(1)(vi) of this section that was submitted to EPA as part of the program's application for accreditation.

(viii) For renovator refresher and dust sampling technician refresher courses, a copy of each trainee's prior course completion certificate showing that each trainee was eligible to take the refresher course.

(ix) For course modules delivered in an electronic format, a record of each student's log-ins, launches, progress, and completion, and a copy of the electronic learning completion certificate for each student.

(2) The training program must retain records pertaining to renovator, dust sampling technician and lead-based paint activities courses at the address specified on the training program accreditation application (or as modified in accordance with paragraph (i)(3) of this section) for the following minimum periods:

(i) Records pertaining to lead-based paint activities courses must be retained for a minimum of 3 years and 6 months.

(ii) Records pertaining to renovator or dust sampling technician courses offered before April 22, 2010 must be retained until July 1, 2015.

(iii) Records pertaining to renovator or dust sampling technician courses offered on or after April 22, 2010 must be retained for a minimum of 5 years.

(3) The training program shall notify EPA in writing within 30 days of changing the address specified on its training program accreditation application or transferring the records from that address.

(j) *Amendment of accreditation.* (1) A training program must amend its accreditation within 90 days of the date a change occurs to information included in the program's most recent application. If the training program fails to amend its accreditation within 90 days of the date the change occurs, the program may not provide renovator, dust sampling technician, or lead-based paint activities training until its accreditation is amended.

(2) To amend an accreditation, a training program must submit a completed “Accreditation Application for Training Providers,” signed by an authorized agent of the training provider, noting on the form that it is submitted as an amendment and indicating the information that has changed.

(3) *Training managers, principal instructors, permanent training locations.* If the amendment includes a new training program manager, any new or additional principal instructor(s), or any new permanent training location(s), the training provider is not permitted to provide training under the new training manager or offer courses taught by any new principal instructor(s) or at the new training location(s) until EPA either approves the amendment or 30 days have elapsed, whichever occurs earlier. Except:

(i) If the amendment includes a new training program manager or new or additional principal instructor that was identified in a training provider accreditation application that EPA has already approved under this section, the training provider may begin to provide training under the new training manager or offer courses taught by the new principal instructor on an interim basis as soon as the provider submits the amendment to EPA. The training provider may continue to provide training under the new training manager or offer courses taught by the new principal instructor if EPA approves the amendment or if EPA does not disapprove the amendment within 30 days.

(ii) If the amendment includes a new permanent training location, the training provider may begin to provide training at the new permanent training location on an interim basis as soon as the provider submits the amendment to EPA. The training provider may continue to provide training at the new permanent training location if EPA approves the amendment or if EPA does not disapprove the amendment within 30 days.

[76 FR 47939, Aug. 5, 2011]

§ 745.226 Certification of individuals and firms engaged in lead-based paint activities: target housing and child-occupied facilities.

(a) *Certification of individuals.* (1) Individuals seeking certification by EPA to engage in lead-based paint activities must either:

(i) Submit to EPA an application demonstrating that they meet the requirements established in paragraphs (b) or (c) of this section for the particular discipline for which certification is sought; or

(ii) Submit to EPA an application with a copy of a valid lead-based paint activities certification (or equivalent) from a State or Tribal program that has been authorized by EPA pursuant to subpart Q of this part.

(2) Individuals may first apply to EPA for certification to engage in lead-based paint activities pursuant to this section on or after March 1, 1999.

(3) Following the submission of an application demonstrating that all the requirements of this section have been meet, EPA shall certify an applicant as an inspector, risk assessor, supervisor, project designer, or abatement worker, as appropriate.

(4) Upon receiving EPA certification, individuals conducting lead-based paint activities shall comply with the work practice standards for performing the appropriate lead-based paint activities as established in § 745.227.

(5) It shall be a violation of TSCA for an individual to conduct any of the lead-based paint activities described in § 745.227 after March 1, 2000, if that individual has not been certified by EPA pursuant to this section to do so.

(6) Individuals applying for certification must submit the appropriate fees in accordance with § 745.238.

(b) *Inspector, risk assessor or supervisor.* (1) To become certified by EPA as an inspector, risk assessor, or supervisor, pursuant to paragraph (a)(1)(i) of this section, an individual must:

(i) Successfully complete an accredited course in the appropriate discipline and receive a course completion certificate from an accredited training program.

(ii) Pass the certification exam in the appropriate discipline offered by EPA; and,

(iii) Meet or exceed the following experience and/or education requirements:

(A) Inspectors. (*1*) No additional experience and/or education requirements.

(*2*) [Reserved]

(B) Risk assessors. (*1*) Successful completion of an accredited training course for inspectors; and

(*2*) Bachelor's degree and 1 year of experience in a related field (e.g., lead, asbestos, environmental remediation work, or construction), or an Associates degree and 2 years experience in a related field (e.g., lead, asbestos, environmental remediation work, or construction); or

(*3*) Certification as an industrial hygienist, professional engineer, registered architect and/or certification in a related engineering/health/environmental field (e.g., safety professional, environmental scientist); or

(*4*) A high school diploma (or equivalent), and at least 3 years of experience in a related field (e.g., lead, asbestos, environmental remediation work or construction).

(C) Supervisor: (*1*) One year of experience as a certified lead-based paint abatement worker; or

(*2*) At least 2 years of experience in a related field (e.g., lead, asbestos, or environmental remediation work) or in the building trades.

(2) The following documents shall be recognized by EPA as evidence of meeting the requirements listed in (b)(2)(iii) of this paragraph:

(i) Official academic transcripts or diploma, as evidence of meeting the education requirements.

(ii) Resumes, letters of reference, or documentation of work experience, as evidence of meeting the work experience requirements.

(iii) Course completion certificates from lead-specific or other related training courses, issued by accredited training programs, as evidence of meeting the training requirements.

(3) In order to take the certification examination for a particular discipline an individual must:

(i) Successfully complete an accredited course in the appropriate discipline and receive a course completion certificate from an accredited training program.

(ii) Meet or exceed the education and/or experience requirements in paragraph (b)(1)(iii) of this section.

(4) The course completion certificate shall serve as interim certification for an individual until the next available opportunity to take the certification exam. Such interim certification shall expire 6 months after issuance.

(5) After passing the appropriate certification exam and submitting an application demonstrating that he/she meets the appropriate training, education, and/or experience prerequisites described in paragraph (b)(1) of this section, an individual shall be issued a certificate by EPA. To maintain certification, an individual must be re-certified as described in paragraph (e) of this section.

(6) An individual may take the certification exam no more than three times within 6 months of receiving a course completion certificate.

(7) If an individual does not pass the certification exam and receive a certificate within 6 months of receiving his/her course completion certificate, the individual must retake the appropriate course from an accredited training program before reapplying for certification from EPA.

(c) *Abatement worker and project designer.* (1) To become certified by EPA as an abatement worker or project designer, pursuant to paragraph (a)(1)(i) of this section, an individual must:

(i) Successfully complete an accredited course in the appropriate discipline and receive a course completion certificate from an accredited training program.

(ii) Meet or exceed the following additional experience and/or education requirements:

(A) Abatement workers. (*1*) No additional experience and/or education requirements.

(*2*) [Reserved]

(B) Project designers. (*1*) Successful completion of an accredited training course for supervisors.

(*2*) Bachelor's degree in engineering, architecture, or a related profession, and 1 year of experience in building construction and design or a related field; or

(*3*) Four years of experience in building construction and design or a related field.

(2) The following documents shall be recognized by EPA as evidence of meeting the requirements listed in this paragraph:

(i) Official academic transcripts or diploma, as evidence of meeting the education requirements.

(ii) Resumes, letters of reference, or documentation of work experience, as evidence of meeting the work experience requirements.

(iii) Course completion certificates from lead-specific or other related training courses, issued by accredited training programs, as evidence of meeting the training requirements.

(3) The course completion certificate shall serve as an interim certification until certification from EPA is received, but shall be valid for no more than 6 months from the date of completion.

(4) After successfully completing the appropriate training courses and meeting any other qualifications described in paragraph (c)(1) of this section, an individual shall be issued a certificate from EPA. To maintain certification, an individual must be re-certified as described in paragraph (e) of this section.

(d) *Certification based on prior training.* (1) Any individual who received training in a lead-based paint activity between October 1, 1990, and March 1, 1999 shall be eligible for certification by EPA under the alternative procedures contained in this paragraph. Individuals who have received lead-based paint activities training at an EPA-authorized State or Tribal accredited training program shall also be eligible for certification by EPA under the following alternative procedures:

(i) Applicants for certification as an inspector, risk assessor, or supervisor shall:

(A) Demonstrate that the applicant has successfully completed training or on-the-job training in the conduct of a lead-based paint activity.

(B) Demonstrate that the applicant meets or exceeds the education and/or experience requirements in paragraph (b)(1)(iii) of this section.

(C) Successfully complete an accredited refresher training course for the appropriate discipline.

(D) Pass a certification exam administered by EPA for the appropriate discipline.

(ii) Applicants for certification as an abatement worker or project designer shall:

(A) Demonstrate that the applicant has successfully completed training or on-the-job training in the conduct of a lead-based paint activity.

(B) Demonstrate that the applicant meets the education and/or experience requirements in paragraphs (c)(1) of this section; and

(C) Successfully complete an accredited refresher training course for the appropriate discipline.

(2) Individuals shall have until March 1, 2000, to apply to EPA for certification under the above procedures. After that date, all individuals wishing to obtain certification must do so through the procedures described in paragraph (a), and paragraph (b) or (c) of this section, according to the discipline for which certification is being sought.

(e) *Re-certification.* (1) To maintain certification in a particular discipline, a certified individual shall apply to and be re-certified by EPA in that discipline by EPA either:

(i) Every 3 years if the individual completed a training course with a course test and hands-on assessment; or

(ii) Every 5 years if the individual completed a training course with a proficiency test.

(2) An individual shall be re-certified if the individual successfully completes the appropriate accredited refresher training course and submits a valid copy of the appropriate refresher course completion certificate.

(3) Individuals applying for re-certification must submit the appropriate fees in accordance with § 745.238.

(f) *Certification of firms.* (1) All firms which perform or offer to perform any of the lead-based paint activities described in § 745.227 after March 1, 2000, shall be certified by EPA.

(2) A firm seeking certification shall submit to EPA a letter attesting that the firm shall only employ appropriately certified employees to conduct lead-based paint activities, and that the firm and its employees shall follow the work practice standards in § 745.227 for conducting lead-based paint activities.

(3) From the date of receiving the firm's letter requesting certification, EPA shall have 90 days to approve or disapprove the firm's request for certification. Within that time, EPA shall respond with either a certificate of approval or a letter describing the reasons for a disapproval.

(4) The firm shall maintain all records pursuant to the requirements in § 745.227.

(5) Firms may first apply to EPA for certification to engage in lead-based paint activities pursuant to this section on or after March 1, 1999.

(6) Firms applying for certification must submit the appropriate fees in accordance with § 745.238.

(7) To maintain certification a firm shall submit appropriate fees in accordance with § 745.238 every 3 years.

(g) *Suspension, revocation, and modification of certifications of individuals engaged in lead-based paint activities.* (1) EPA may, after notice and opportunity for hearing, suspend, revoke, or modify an individual's certification if an individual has:

(i) Obtained training documentation through fraudulent means.

(ii) Gained admission to and completed an accredited training program through misrepresentation of admission requirements.

(iii) Obtained certification through misrepresentation of certification requirements or related documents dealing with education, training, professional registration, or experience.

(iv) Performed work requiring certification at a job site without having proof of certification.

(v) Permitted the duplication or use of the individual's own certificate by another.

(vi) Performed work for which certification is required, but for which appropriate certification has not been received.

(vii) Failed to comply with the appropriate work practice standards for lead-based paint activities at § 745.227.

(viii) Failed to comply with Federal, State, or local lead-based paint statutes or regulations.

(2) In addition to an administrative or judicial finding of violation, for purposes of this section only, execution of a consent agreement in settlement of an enforcement action constitutes evidence of a failure to comply with relevant statutes or regulations.

(h) *Suspension, revocation, and modification of certifications of firms engaged in lead-based paint activities.* (1) EPA may, after notice and opportunity for hearing, suspend, revoke, or modify a firm's certification if a firm has:

(i) Performed work requiring certification at a job site with individuals who are not certified.

(ii) Failed to comply with the work practice standards established in § 745.227.

(iii) Misrepresented facts in its letter of application for certification to EPA.

(iv) Failed to maintain required records.

(v) Failed to comply with Federal, State, or local lead-based paint statutes or regulations.

(2) In addition to an administrative or judicial finding of violation, for purposes of this section only, execution of a consent agreement in settlement of an enforcement action constitutes evidence of a failure to comply with relevant statutes or regulations.

(i) *Procedures for suspension, revocation, or modification of the certification of individuals or firms* .

(1) If EPA decides to suspend, revoke, or modify the certification of any individual or firm, it shall notify the affected entity in writing of the following:

(i) The legal and factual basis for the suspension, revocation, or modification.

(ii) The commencement date and duration of the suspension, revocation, or modification.

(iii) Actions, if any, which the affected entity may take to avoid suspension, revocation, or modification or to receive certification in the future.

(iv) The opportunity and method for requesting a hearing prior to final EPA action to suspend, revoke, or modify certification.

(v) Any additional information, as appropriate, which EPA may provide.

(2) If a hearing is requested by the certified individual or firm, EPA shall:

(i) Provide the affected entity an opportunity to offer written statements in response to EPA's assertion of the legal and factual basis and any other explanations, comments, and arguments it deems relevant to the proposed action.

(ii) Provide the affected entity such other procedural opportunities as EPA may deem appropriate to ensure a fair and impartial hearing.

(iii) Appoint an official of EPA as Presiding Officer to conduct the hearing. No person shall serve as Presiding Officer if he or she has had any prior connection with the specific matter.

(3) The Presiding Officer shall:

(i) Conduct a fair, orderly, and impartial hearing within 90 days of the request for a hearing;

(ii) Consider all relevant evidence, explanation, comment, and argument submitted; and

(iii) Notify the affected entity in writing within 90 days of completion of the hearing of his or her decision and order. Such an order is a final EPA action subject to judicial review.

(4) If EPA determines that the public health, interest, or welfare warrants immediate action to suspend the certification of any individual or firm prior to the opportunity for a hearing, it shall:

(i) Notify the affected entity of its intent to immediately suspend certification for the reasons listed in paragraph (h)(1) of this section. If a suspension, revocation, or modification notice has not previously been issued, it shall be issued at the same time the immediate suspension notice is issued.

(ii) Notify the affected entity in writing of the grounds upon which the immediate suspension is based and why it is necessary to suspend the entity's accreditation before an opportunity for a hearing to suspend, revoke, or modify the individual's or firm's certification.

(iii) Notify the affected entity of the commencement date and duration of the immediate suspension.

(iv) Notify the affected entity of its right to request a hearing on the immediate suspension within 15 days of the suspension taking place and the procedures for the conduct of such a hearing.

(5) Any notice, decision, or order issued by EPA under this section, transcript or other verbatim record of oral testimony, and any documents filed by a certified individual or firm in a hearing under this section shall be available to the public, except as otherwise provided by section 14 of TSCA or by part 2 of this title. Any such hearing at which oral testimony is presented shall be open to the public, except that

the Presiding Officer may exclude the public to the extent necessary to allow presentation of information which may be entitled to confidential treatment under section 14 of TSCA or part 2 of this title.

[61 FR 45813, Aug. 29, 1996, as amended at 64 FR 31098, June 9, 1999; 64 FR 42851, Aug. 6, 1999]

§ 745.227 Work practice standards for conducting lead-based paint activities: target housing and child-occupied facilities.

(a) *Effective date, applicability, and terms.* (1) Beginning on March 1, 2000, all lead-based paint activities shall be performed pursuant to the work practice standards contained in this section.

(2) When performing any lead-based paint activity described by the certified individual as an inspection, lead-hazard screen, risk assessment or abatement, a certified individual must perform that activity in compliance with the appropriate requirements below.

(3) Documented methodologies that are appropriate for this section are found in the following: The U.S. Department of Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing; the EPA Guidance on Residential Lead-Based Paint, Lead-Contaminated Dust, and Lead-Contaminated Soil; the EPA Residential Sampling for Lead: Protocols for Dust and Soil Sampling (EPA report number 7474-R-95-001); Regulations, guidance, methods or protocols issued by States and Indian Tribes that have been authorized by EPA; and other equivalent methods and quidelines.

(4) Clearance levels are appropriate for the purposes of this section may be found in the EPA Guidance on Residential Lead-Based Paint, Lead-Contaminated Dust, and Lead Contaminiated Soil or other equivalent guidelines.

(b) *Inspection.* (1) An inspection shall be conducted only by a person certified by EPA as an inspector or risk assessor and, if conducted, must be conducted according to the procedures in this paragraph.

(2) When conducting an inspection, the following locations shall be selected according to documented methodologies and tested for the presence of lead-based paint:

(i) In a residential dwelling and child-occupied facility, each component with a distinct painting history and each exterior component with a distinct painting history shall be tested for lead-based paint, except those components that the inspector or risk assessor determines to have been replaced after 1978, or to not contain lead-based paint; and

(ii) In a multi-family dwelling or child-occupied facility, each component with a distinct painting history in every common area, except those components that the inspector or risk assessor determines to have been replaced after 1978, or to not contain lead-based paint.

(3) Paint shall be sampled in the following manner: (i) The analysis of paint to determine the presence of lead shall be conducted using documented methodologies which incorporate adequate quality control procedures; and/or

(ii) All collected paint chip samples shall be analyzed according to paragraph (f) of this section to determine if they contain detectable levels of lead that can be quantified numerically.

(4) The certified inspector or risk assessor shall prepare an inspection report which shall include the following information:

(i) Date of each inspection.

(ii) Address of building.

(iii) Date of construction.

(iv) Apartment numbers (if applicable).

(v) Name, address, and telephone number of the owner or owners of each residential dwelling or child-occupied facility.

(vi) Name, signature, and certification number of each certified inspector and/or risk assessor conducting testing.

(vii) Name, address, and telephone number of the certified firm employing each inspector and/or risk assessor, if applicable.

(viii) Each testing method and device and/or sampling procedure employed for paint analysis, including quality control data and, if used, the serial number of any x-ray fluorescence (XRF) device.

(ix) Specific locations of each painted component tested for the presence of lead-based paint.

(x) The results of the inspection expressed in terms appropriate to the sampling method used.

(c) *Lead hazard screen.* (1) A lead hazard screen shall be conducted only by a person certified by EPA as a risk assessor.

(2) If conducted, a lead hazard screen shall be conducted as follows:

(i) Background information regarding the physical characteristics of the residential dwelling or child-occupied facility and occupant use patterns that may cause lead-based paint exposure to one or more children age 6 years and under shall be collected.

(ii) A visual inspection of the residential dwelling or child-occupied facility shall be conducted to:

(A) Determine if any deteriorated paint is present, and

(B) Locate at least two dust sampling locations.

(iii) If deteriorated paint is present, each surface with deteriorated paint, which is determined, using documented methodologies, to be in poor condition and to have a distinct painting history, shall be tested for the presence of lead.

(iv) In residential dwellings, two composite dust samples shall be collected, one from the floors and the other from the windows, in rooms, hallways or stairwells where one or more children, age 6 and under, are most likely to come in contact with dust.

(v) In multi-family dwellings and child-occupied facilities, in addition to the floor and window samples required in paragraph (c)(1)(iii) of this section, the risk assessor shall also collect composite dust samples from common areas where one or more children, age 6 and under, are most likely to come into contact with dust.

(3) Dust samples shall be collected and analyzed in the following manner:

(i) All dust samples shall be taken using documented methodologies that incorporate adequate quality control procedures.

(ii) All collected dust samples shall be analyzed according to paragraph (f) of this section to determine if they contain detectable levels of lead that can be quantified numerically.

(4) Paint shall be sampled in the following manner: (i) The analysis of paint to determine the presence of lead shall be conducted using documented methodologies which incorporate adequate quality control procedures; and/or

(ii) All collected paint chip samples shall be analyzed according to paragraph (f) of this section to determine if they contain detectable levels of lead that can be quantified numerically.

(5) The risk assessor shall prepare a lead hazard screen report, which shall include the following information:

(i) The information required in a risk assessment report as specified in paragraph (d) of this section, including paragraphs (d)(11)(i) through (d)(11)(xiv), and excluding paragraphs (d)(11)(xv) through (d)(11)(xviii) of this section. Additionally, any background information collected pursuant to paragraph (c)(2)(i) of this section shall be included in the risk assessment report; and

(ii) Recommendations, if warranted, for a follow-up risk assessment, and as appropriate, any further actions.

(d) *Risk assessment.* (1) A risk assessment shall be conducted only by a person certified by EPA as a risk assessor and, if conducted, must be conducted according to the procedures in this paragraph.

(2) A visual inspection for risk assessment of the residential dwelling or child-occupied facility shall be undertaken to locate the existence of deteriorated paint, assess the extent and causes of the deterioration, and other potential lead-based paint hazards.

(3) Background information regarding the physical characteristics of the residential dwelling or child-occupied facility and occupant use patterns that may cause lead-based paint exposure to one or more children age 6 years and under shall be collected.

(4) The following surfaces which are determined, using documented methodologies, to have a distinct painting history, shall be tested for the presence of lead:

(i) Each friction surface or impact surface with visibly deteriorated paint; and

(ii) All other surfaces with visibly deteriorated paint.

(5) In residential dwellings, dust samples (either composite or single-surface samples) from the interior window sill(s) and floor shall be collected and analyzed for lead concentration in all living areas where one or more children, age 6 and under, are most likely to come into contact with dust.

(6) For multi-family dwellings and child-occupied facilities, the samples required in paragraph (d)(4) of this section shall be taken. In addition, interior window sill and floor dust samples (either composite or single-surface samples) shall be collected and analyzed for lead concentration in the following locations:

(i) Common areas adjacent to the sampled residential dwelling or child-occupied facility; and

(ii) Other common areas in the building where the risk assessor determines that one or more children, age 6 and under, are likely to come into contact with dust.

(7) For child-occupied facilities, interior window sill and floor dust samples (either composite or single-surface samples) shall be collected and analyzed for lead concentration in each room, hallway or stairwell utilized by one or more children, age 6 and under, and in other common areas in the child-occupied facility where one or more children, age 6 and under, are likely to come into contact with dust.

(8) Soil samples shall be collected and analyzed for lead concentrations in the following locations:

(i) Exterior play areas where bare soil is present; and

(ii) The rest of the yard (i.e., non-play areas) where bare soil is present.

(iii) Dripline/foundation areas where bare soil is present.

(9) Any paint, dust, or soil sampling or testing shall be conducted using documented methodologies that incorporate adequate quality control procedures.

(10) Any collected paint chip, dust, or soil samples shall be analyzed according to paragraph (f) of this section to determine if they contain detectable levels of lead that can be quantified numerically.

(11) The certified risk assessor shall prepare a risk assessment report which shall include the following information:

(i) Date of assessment.

(ii) Address of each building.

(iii) Date of construction of buildings.

(iv) Apartment number (if applicable).

(v) Name, address, and telephone number of each owner of each building.

(vi) Name, signature, and certification of the certified risk assessor conducting the assessment.

(vii) Name, address, and telephone number of the certified firm employing each certified risk assessor if applicable.

(viii) Name, address, and telephone number of each recognized laboratory conducting analysis of collected samples.

(ix) Results of the visual inspection.

(x) Testing method and sampling procedure for paint analysis employed.

(xi) Specific locations of each painted component tested for the presence of lead.

(xii) All data collected from on-site testing, including quality control data and, if used, the serial number of any XRF device.

(xiii) All results of laboratory analysis on collected paint, soil, and dust samples.

(xiv) Any other sampling results.

(xv) Any background information collected pursuant to paragraph (d)(3) of this section.

(xvi) To the extent that they are used as part of the lead-based paint hazard determination, the results of any previous inspections or analyses for the presence of lead-based paint, or other assessments of lead-based paint-related hazards.

(xvii) A description of the location, type, and severity of identified lead-based paint hazards and any other potential lead hazards.

(xviii) A description of interim controls and/or abatement options for each identified lead-based paint hazard and a suggested prioritization for addressing each hazard. If the use of an encapsulant or enclosure is recommended, the report shall recommend a maintenance and monitoring schedule for the encapsulant or enclosure.

(e) *Abatement.* (1) An abatement shall be conducted only by an individual certified by EPA, and if conducted, shall be conducted according to the procedures in this paragraph.

(2) A certified supervisor is required for each abatement project and shall be onsite during all work site preparation and during the post-abatement cleanup of work areas. At all other times when abatement activities are being conducted, the certified supervisor shall be onsite or available by telephone, pager or answering service, and able to be present at the work site in no more than 2 hours.

(3) The certified supervisor and the certified firm employing that supervisor shall ensure that all abatement activities are conducted according to the requirements of this section and all other Federal, State and local requirements.

(4) A certified firm must notify EPA of lead-based paint abatement activities as follows:

(i) Except as provided in paragraph (e)(4)(ii) of this section, EPA must be notified prior to conducting lead-based paint abatement activities. The original notification must be received by EPA at least 5 business days before the start date of any lead-based paint abatement activities.

(ii) Notification for lead-based paint abatement activities required in response to an elevated blood lead level (EBL) determination, or Federal, State, Tribal, or local emergency abatement order should be received by EPA as early as possible before, but must be received no later than the start date of the lead-based paint abatement activities. Should the start date and/or location provided to EPA change, an updated notification must be received by EPA on or before the start date provided to EPA. Documentation showing evidence of an EBL determination or a copy of the Federal/State/Tribal/local emergency abatement order must be included in the written notification to take advantage of this abbreviated notification period.

(iii) Except as provided in paragraph (e)(4)(ii) of this section, updated notification must be provided to EPA for lead-based paint abatement activities that will begin on a date other than the start date specified in the original notification, as follows:

(A) For lead-based paint abatement activities beginning prior to the start date provided to EPA an updated notification must be received by EPA at least 5 business days before the new start date included in the notification.

(B) For lead-based paint abatement activities beginning after the start date provided to EPA an updated notification must be received by EPA on or before the start date provided to EPA.

(iv) Except as provided in paragraph (e)(4)(ii) of this section, updated notification must be provided to EPA for any change in location of lead-based paint abatement activities at least 5 business days prior to the start date provided to EPA.

(v) Updated notification must be provided to EPA when lead-based paint abatement activities are canceled, or when there are other significant changes including, but not limited to, when the square footage or acreage to be abated changes by more than 20%. This updated notification must be received by EPA on or before the start date provided to EPA, or if work has already begun, within 24 hours of the change.

(vi) The following must be included in each notification:

(A) Notification type (original, updated, cancellation).

(B) Date when lead-based paint abatement activities will start.

(C) Date when lead-based paint abatement activities will end (approximation using best professional judgement).

(D) Firm's name, EPA certification number, address, telephone number.

(E) Type of building (e.g., single family dwelling, multi-family dwelling, child-occupied facilities) on/in which abatement work will be performed.

(F) Property name (if applicable).

(G) Property address including apartment or unit number(s) (if applicable) for abatement work.

(H) Documentation showing evidence of an EBL determination or a copy of the Federal/State/Tribal/local emergency abatement order, if using the abbreviated time period as described in paragraph (e)(4)(ii) of this section.

(I) Name and EPA certification number of the project supervisor.

(J) Approximate square footage/acreage to be abated.

(K) Brief description of abatement activities to be performed.

(L) Name, title, and signature of the representative of the certified firm who prepared the notification.

(vii) Notification must be accomplished using any of the following methods: Written notification, or electronically using the Agency's Central Data Exchange (CDX). Written notification can be accomplished using either the sample form titled “Notification of Lead-Based Paint Abatement Activities” or similar form containing the information required in paragraph (e)(4)(vi) of this section. All written notifications must be delivered by U.S. Postal Service, fax, commercial delivery service, or hand delivery (persons submitting

notification by U.S. Postal Service are reminded that they should allow 3 additional business days for delivery in order to ensure that EPA receives the notification by the required date). Instructions and sample forms can be obtained from the NLIC at 1-800-424-LEAD(5323), or on the Internet at *http://www.epa.gov/lead* .

(viii) Lead-based paint abatement activities shall not begin on a date, or at a location other than that specified in either an original or updated notification, in the event of changes to the original notification.

(ix) No firm or individual shall engage in lead-based paint abatement activities, as defined in § 745.223, prior to notifying EPA of such activities according to the requirements of this paragraph.

(5) A written occupant protection plan shall be developed for all abatement projects and shall be prepared according to the following procedures:

(i) The occupant protection plan shall be unique to each residential dwelling or child-occupied facility and be developed prior to the abatement. The occupant protection plan shall describe the measures and management procedures that will be taken during the abatement to protect the building occupants from exposure to any lead-based paint hazards.

(ii) A certified supervisor or project designer shall prepare the occupant protection plan.

(6) The work practices listed below shall be restricted during an abatement as follows:

(i) Open-flame burning or torching of lead-based paint is prohibited;

(ii) Machine sanding or grinding or abrasive blasting or sandblasting of lead-based paint is prohibited unless used with High Efficiency Particulate Air (HEPA) exhaust control which removes particles of 0.3 microns or larger from the air at 99.97 percent or greater efficiency;

(iii) Dry scraping of lead-based paint is permitted only in conjunction with heat guns or around electrical outlets or when treating defective paint spots totaling no more than 2 square feet in any one room, hallway or stairwell or totaling no more than 20 square feet on exterior surfaces; and

(iv) Operating a heat gun on lead-based paint is permitted only at temperatures below 1100 degrees Fahrenheit.

(7) If conducted, soil abatement shall be conducted in one of the following ways:

(i) If the soil is removed:

(A) The soil shall be replaced by soil with a lead concentration as close to local background as practicable, but no greater than 400 ppm.

(B) The soil that is removed shall not be used as top soil at another residential property or child-occupied facility.

(ii) If soil is not removed, the soil shall be permanently covered, as defined in § 745.223.

(8) The following post-abatement clearance procedures shall be performed only by a certified inspector or risk assessor:

(i) Following an abatement, a visual inspection shall be performed to determine if deteriorated painted surfaces and/or visible amounts of dust, debris or residue are still present. If deteriorated painted surfaces or visible amounts of dust, debris or residue are present, these conditions must be eliminated prior to the continuation of the clearance procedures.

(ii) Following the visual inspection and any post-abatement cleanup required by paragraph (e)(8)(i) of this section, clearance sampling for lead in dust shall be conducted. Clearance sampling may be conducted by employing single-surface sampling or composite sampling techniques.

(iii) Dust samples for clearance purposes shall be taken using documented methodologies that incorporate adequate quality control procedures.

(iv) Dust samples for clearance purposes shall be taken a minimum of 1 hour after completion of final post-abatement cleanup activities.

(v) The following post-abatement clearance activities shall be conducted as appropriate based upon the extent or manner of abatement activities conducted in or to the residential dwelling or child-occupied facility:

(A) After conducting an abatement with containment between abated and unabated areas, one dust sample shall be taken from one interior window sill and from one window trough (if present) and one dust sample shall be taken from the floors of each of no less than four rooms, hallways or stairwells within the containment area. In addition, one dust sample shall be taken from the floor outside the containment area. If there are less than four rooms, hallways or stairwells within the containment area, then all rooms, hallways or stairwells shall be sampled.

(B) After conducting an abatement with no containment, two dust samples shall be taken from each of no less than four rooms, hallways or stairwells in the residential dwelling or child-occupied facility. One dust sample shall be taken from one interior window sill and window trough (if present) and one dust sample shall be taken from the floor of each room, hallway or stairwell selected. If there are less than four rooms, hallways or stairwells within the residential dwelling or child-occupied facility then all rooms, hallways or stairwells shall be sampled.

(C) Following an exterior paint abatement, a visible inspection shall be conducted. All horizontal surfaces in the outdoor living area closest to the abated surface shall be found to be cleaned of visible dust and debris. In addition, a visual inspection shall be conducted to determine the presence of paint chips on the dripline or next to the foundation below any exterior surface abated. If paint chips are present, they must be removed from the site and properly disposed of, according to all applicable Federal, State and local requirements.

(vi) The rooms, hallways or stairwells selected for sampling shall be selected according to documented methodologies.

(vii) The certified inspector or risk assessor shall compare the residual lead level (as determined by the laboratory analysis) from each single surface dust sample with clearance levels in paragraph (e)(8)(viii) of this section for lead in dust on floors, interior window sills, and window troughs or from each composite dust sample with the applicable clearance levels for lead in dust on floors, interior window sills, and window troughs divided by half the number of subsamples in the composite sample. If the residual lead level in a single surface dust sample equals or exceeds the applicable clearance level or if the residual lead level in a composite dust sample equals or exceeds the applicable clearance level divided by half the number of subsamples in the composite sample, the components represented by the failed sample shall be recleaned and retested.

(viii) The clearance levels for lead in dust are 40 μg/ft^2 for floors, 250 μg/ft^2 for interior window sills, and 400 μg/ft^2 for window troughs.

(9) In a multi-family dwelling with similarly constructed and maintained residential dwellings, random sampling for the purposes of clearance may be conducted provided:

(i) The certified individuals who abate or clean the residential dwellings do not know which residential dwelling will be selected for the random sample.

(ii) A sufficient number of residential dwellings are selected for dust sampling to provide a 95 percent level of confidence that no more than 5 percent or 50 of the residential dwellings (whichever is smaller) in the randomly sampled population exceed the appropriate clearance levels.

(iii) The randomly selected residential dwellings shall be sampled and evaluated for clearance according to the procedures found in paragraph (e)(8) of this section.

(10) An abatement report shall be prepared by a certified supervisor or project designer. The abatement report shall include the following information:

(i) Start and completion dates of abatement.

(ii) The name and address of each certified firm conducting the abatement and the name of each supervisor assigned to the abatement project.

(iii) The occupant protection plan prepared pursuant to paragraph (e)(5) of this section.

(iv) The name, address, and signature of each certified risk assessor or inspector conducting clearance sampling and the date of clearance testing.

(v) The results of clearance testing and all soil analyses (if applicable) and the name of each recognized laboratory that conducted the analyses.

(vi) A detailed written description of the abatement, including abatement methods used, locations of rooms and/or components where abatement occurred, reason for selecting particular abatement methods for each component, and any suggested monitoring of encapsulants or enclosures.

(f) *Collection and laboratory analysis of samples.* Any paint chip, dust, or soil samples collected pursuant to the work practice standards contained in this section shall be:

(1) Collected by persons certified by EPA as an inspector or risk assessor; and

(2) Analyzed by a laboratory recognized by EPA pursuant to section 405(b) of TSCA as being capable of performing analyses for lead compounds in paint chip, dust, and soil samples.

(g) *Composite dust sampling.* Composite dust sampling may only be conducted in the situations specified in paragraphs (c) through (e) of this section. If such sampling is conducted, the following conditions shall apply:

(1) Composite dust samples shall consist of at least two subsamples;

(2) Every component that is being tested shall be included in the sampling; and

(3) Composite dust samples shall not consist of subsamples from more than one type of component.

(h) *Determinations.* (1) Lead-based paint is present:

(i) On any surface that is tested and found to contain lead equal to or in excess of 1.0 milligrams per square centimeter or equal to or in excess of 0.5% by weight; and

(ii) On any surface like a surface tested in the same room equivalent that has a similar painting history and that is found to be lead-based paint.

(2) A paint-lead hazard is present:

(i) On any friction surface that is subject to abrasion and where the lead dust levels on the nearest horizontal surface underneath the friction surface (e.g., the window sill or floor) are equal to or greater than the dust hazard levels identified in § 745.227(b);

(ii) On any chewable lead-based paint surface on which there is evidence of teeth marks;

(iii) Where there is any damaged or otherwise deteriorated lead-based paint on an impact surface that is cause by impact from a related building component (such as a door knob that knocks into a wall or a door that knocks against its door frame; and

(iv) If there is any other deteriorated lead-based paint in any residential building or child-occupied facility or on the exterior of any residential building or child-occupied facility.

(3) A dust-lead hazard is present in a residential dwelling or child occupied facility:

(i) In a residential dwelling on floors and interior window sills when the weighted arithmetic mean lead loading for all single surface or composite samples of floors and interior window sills are equal to or greater than 40 μg/ft^2 for floors and 250 μg/ft^2 for interior window sills, respectively;

(ii) On floors or interior window sills in an unsampled residential dwelling in a multi-family dwelling, if a dust-lead hazard is present on floors or interior window sills, respectively, in at least one sampled residential unit on the property; and

(iii) On floors or interior window sills in an unsampled common area in a multi-family dwelling, if a dust-lead hazard is present on floors or interior window sills, respectively, in at least one sampled common area in the same common area group on the property.

(4) A soil-lead hazard is present:

(i) In a play area when the soil-lead concentration from a composite play area sample of bare soil is equal to or greater than 400 parts per million; or

(ii) In the rest of the yard when the arithmetic mean lead concentration from a composite sample (or arithmetic mean of composite samples) of bare soil from the rest of the yard (i.e., non-play areas) for each residential building on a property is equal to or greater than 1,200 parts per million.

(i) *Recordkeeping.* All reports or plans required in this section shall be maintained by the certified firm or individual who prepared the report for no fewer than 3 years. The certified firm or individual also shall provide copies of these reports to the building owner who contracted for its services.

[61 FR 45813, Aug. 29, 1996, as amended at 64 FR 42852, Aug. 6, 1999; 66 FR 1239, Jan. 5, 2001; 69 FR 18496, Apr. 8, 2004]

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How to Do It

1. **If possible, perform the work in a vacant unit.** If this is not possible, relocate residents if the work in their unit will last for more than a short time. If residents must remain inside the dwelling during work, appropriate containment and barrier systems as described in this chapter should be installed. Never permit residents to enter a work area where work disturbing known or presumed lead-based paint, or cleanup of lead-contaminated dust or sol, is underway. See Section IV, Temporary Relocation.

2. **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. Use guidance in Section III of this chapter. Avoid high-dust jobs and procedures, if at all possible.

3. **Perform pre-renovation education about lead-based paint hazards** as required by EPA regulations and some State, tribal and/or local requirements. Consider providing pre-renovation education even if the regulations do not require doing so.

4. **Determine if the dwelling will require pre-cleaning** before worksite containment. (See Section II.E.) If the paint is severely deteriorated and paint chips or dust or debris are present, vacuum the floor before protective sheeting is laid down.

5. **Implement relocation plan, if needed, and begin worksite preparation.**

6. **Restrict access to the work area.** As noted above, never permit residents to enter the work area. When clearance or cleaning verification is performed, entry should be denied until cleaning is complete, and clearance or cleaning verification, as applicable, has been achieved. If clearance or cleaning verification has not been achieved at the end of the day, keep the barriers in place overnight and instruct residents not to enter the work area. Exceptions to these rules are available for elderly residents and hardship cases. See Section IV.A.5.

7. **Conduct daily cleanup.** See the Cleanup row of Table 8.1.

8. **Perform a visual examination daily.** Conduct this examination to ensure that dust, debris and residue outside the contained work area are removed, and that the contained area has been cleaned up adequately by the daily cleanup.

9. **Perform final cleanup after work is finished.** See the Cleanup row of Table 8.1.

10. **Do not allow residents to reoccupy the work area until a clearance examination, or cleaning verification, as applicable, has been passed.** See the item 10, Clearance, in the How to Do It list at the start of Chapter 11.

11. **Notification of residents.** The property owner or manager should notify residents of what lead-based paint hazards were controlled and how, and the results of the clearance examination or cleaning verification, as applicable – HUD recommends that the residents be notified whether or not the work is federally assisted (if the work is not federally assisted, only the person who ordered the work must be informed of its results).

I. Introduction

Many forms of paint-disturbing work, including renovation, maintenance, and rehabilitation, as well as lead hazard controls, 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 types of work require complete isolation, or containment, of the work area and/or full evacuation of the residents and their belongings. Other jobs require much less site preparation and containment.

Containment refers to various methods of preventing leaded dust from migrating beyond the work area. It includes a variety of measures, including the simple use of disposable, impermeable protective sheeting as drop cloths, the sealing of doors and vents with such sheeting using tape, and measures taken by workers to keep from tracking leaded dust into non-work areas. The required degree of containment depends upon a number of considerations, including: the amount of dust that will be generated (which is affected by the nature of the work and the work practices that are used); resident re` possibilities; the size of the work area; the duration of the job; whether the work is interior or exterior or both; the construction skill levels of workers applicable to their performing specific tasks on the job; and whether there will be air movement within an interior work area due to open windows.

Generally speaking, only small-scale activity should be conducted in occupied units; significant lead hazard control work should be performed in units from which residents have been temporarily relocated or units that are otherwise vacant. Worksite preparation is needed for both interim controls and abatement work. It is also recommended, and sometimes required, for renovation and maintenance jobs if lead-based paint is or may be disturbed.

This chapter describes the general principles behind resident protection and proper worksite preparation. Guidance is provided for interior work, exterior work, window work, and soil-lead hazard control.

Activities that are required by HUD or EPA are identified in this chapter as being "required" or as actions that "must" be done. Activities that are not required by HUD but are recommended by these *Guidelines* are identified as being "recommended" or as actions that "should" be done. Activities that may be done at the discretion of the owner, manager, or contractor are identified as "optional."

II. General Requirements and Other Guidance

A. Small Areas of Paint Disturbance, and Basic Good Work Practices

HUD and EPA regulations do not require the resident protection and worksite preparation practices described in this chapter for non-abatement work if the total amount of disturbed painted surfaces falls within what the HUD Lead Safe Housing Rule (LSHR) (see Appendix 6) refers to as a *de minimis amount*, i.e., a very small area that can be repaired without trained workers, lead-safe work practices or a clearance examination. This small area threshold, which applies to HUD-assisted and HUD-owned housing (and work on other housing that uses the LSHR threshold, inclusive of state and local laws) referred to here as the *de minimis*, is a disruption of no more than:

- 20 square feet (2 square meters) on exterior surfaces;
- 2 square feet (0.2 square meters) in any one interior room or space; or
- 10 percent of the total surface area on an interior or exterior type of component with a small surface area, such as window sills, baseboards, and trim.

EPA excludes from coverage under its Renovation, Repair, and Painting (RRP) Rule (see Appendix 6), a somewhat larger area of interior work than HUD does under its Lead Safe Housing Rule, but does not have an exclusion for work on small amounts of components with small surface areas. EPA's regulatory exclusion is for what the agency calls "minor repair and maintenance activities," which are those that disrupt no more than:

- 6 square feet or less of painted surface per room for interior activities; or
- 20 square feet or less of painted surface for exterior activities;

provided that:

- the work practices prohibited or restricted by the RRP Rule are ***not*** used; and
- the work does ***not*** involve window replacement or demolition of painted surface areas.

(Note that the EPA does not have a minimum size threshold for coverage of its lead abatement rule (see Appendix 6), and that some State, Tribal and local regulations may not recognize these thresholds and may cover work above a smaller threshold or work of any size, however small.)

However, dry scraping or dry sanding even a small amount of lead-based paint can create a lot of lead-contaminated dust, so these *Guidelines* recommend that the following minimal good work practices always be observed when disturbing paint in pre-1978 housing, unless it is known that all layers of paint to be disturbed are not lead-based paint: (the Lead Safe Housing Rule does allow for a limited exception from lead-safe work practices (LSWP; see Section II.D of Chapter 11) on post-1977 components):

1) Never use the prohibited methods of paint removal that are described in Section III.C.1 of Chapter 6 and Section II.D.1 of Chapter 11; and
2) When disturbing paint, always keep residents and pets out of the work area while work is underway and until after the cleanup, and clean the work area thoroughly after finishing, preferably with both high efficiency particulate air (HEPA) vacuuming and wet cleaning.

FIGURE 8.1 Prohibiting resident entry into work area by use of containment barrier.

B. Resident Entry into Work Area Prohibited

In projects covered by the HUD LSHR, and/or the EPA RRP Rule *residents must never be permitted to enter the work area while work is under way. Furthermore, resident reentry into the work area is permitted only after the area has been cleaned and, if required, has passed clearance* (under the LSHR or, optionally, under the RRP Rule) *or cleaning verification* (under the RRP Rule) (see Figure 8.1). While the two rules allow residents to remain in the work area when work that disturbs less the applicable small area threshold is being conducted, both agencies strongly discourage that practice.

All of the worksite preparation strategies discussed in this chapter are based on this fundamental approach. While residents may not be present inside the work area for work covered by the regulations, it is possible for the residents 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, visual evaluation for dust, debris and residue outside of the contained area, and collection of dust samples.

C. Pre-Renovation Education

EPA's RRP regulations amended the Pre-Renovation Education requirements (PRE) by requiring that people who perform renovation of most pre-1978 housing for compensation provide a lead renovation pamphlet to owners and occupants before beginning the renovation (40 CFR 745.84). (See below for information on the pamphlet.) The information contained in the lead renovation pamphlet that is given to owners and occupants before beginning the renovation should be provided in appropriate format(s) to meet the needs of all residents including persons with limited English proficiency and in formats that may be needed for persons who are visually or hearing impaired (Executive Order 13166, derived from Title VI of the Civil Rights Act of 1964).

Renovation is defined in the regulation broadly as "the modification of any existing structure, or portion thereof, that results in the disturbance of painted surfaces, unless that activity is performed as part of an abatement as defined by this part" (40 CFR 745.223). Note that EPA requires resident protection whenever abatement of lead-based paint hazards is being conducted (40 CFR 745.227(e)(5)).

This pre-renovation education requirement does *not* apply to minor repair and maintenance activities, as described above, emergency renovations; renovations of components that have been found by a certified lead-based paint inspector or a certified renovator to be free of lead-based paint; or housing that is not target housing (housing built after 1977, housing that is exclusively for the elderly or persons with disabilities (provided a child of less than 6 does not reside there), and zero-bedroom units).

Emergency renovations are those activities that were not planned but result from a sudden, unexpected event (such as non-routine failures of equipment) that, if not immediately attended to, presents a safety or public health hazard, or threatens equipment and/or property with significant damage; and also interim controls performed in response to an elevated blood lead level in a resident child (see Chapter 16). The RRP rule requires that before work begins, the contractor must give the occupants the EPA pamphlet titled "Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools" in English, and "Guía de Prácticas Acreditadas Seguras para Trabajar con el Plomo para Remodelar Correctamente" ("Remodelar Correctamente") in Spanish, or any State or Tribal pamphlet approved by EPA for the same purpose.

Copies of "Renovate Right" can be obtained from the National Lead Information Center, at 1-800-424-LEAD, or by downloading it from the EPA's or HUD's web site. As of the publication of these *Guidelines,* the pamphlet is available in English and Spanish:

FIGURE 8.2 EPA "Renovate Right" Pamphlet.

- On the EPA website, the English version is available at ***http://www.epa.gov/lead/pubs/renovaterightbrochure.pdf***, and the Spanish version, at ***http://www.epa.gov/lead/pubs/renovaterightbrochure-esp.pdf***.
- On the HUD website, the English version is available at ***http://portal.hud.gov/hudportal/documents/huddoc?id=DOC_12531.pdf***, and the Spanish version, at ***http://portal.hud.gov/hudportal/documents/huddoc?id=DOC_12532.pdf***.

Renovation firms should determine if the State or Tribe is authorized to operate its lead program for abatement, at ***http://www.epa.gov/oppt/lead/pubs/traincert.htm***, and/or for renovation, at ***http://www.epa.gov/lead/pubs/renovation.htm***. Links are provided to individual authorized abatement and renovation programs if they are available. Addresses and links of the EPA Regional Lead Coordinators are provided for States and Tribal areas for which EPA operates the certification and accreditation programs, at EPA's Where You Live lead page, at ***http://www.epa.gov/lead/pubs/leadoff1.htm***. The sites also provide the forms and instructions provided to apply for accreditation or certification for EPA-operated programs. You can get additional assistance from the National Lead Information Center (NLIC) at 800-424-LEAD (5323); hearing- or speech-challenged individuals may access this number through TTY by calling the toll-free Federal Relay Service at 800-877-8339.

D. Written Occupant Protection Plan for Abatement Projects

EPA regulations require that a written occupant protection plan be developed for all abatement projects (40 CFR 745.227(e)(5)). The term "abatement," as defined by EPA, "means any measure or set of measures designed to permanently eliminate lead-based paint hazards." It "does not include renovation, remodeling, landscaping or other activities, when such activities are not designed to permanently eliminate lead-based paint hazards, ... even though these activities may incidentally result in a reduction or elimination of lead-based paint hazards." (40 CFR 745.223). The occupant protection plan is required to:

- be unique to the dwelling or facility;
- be developed before the abatement;
- describe the measures and procedures that will be taken to protect the occupants from exposure to lead-based paint hazards; and
- be prepared by a certified lead-based paint abatement supervisor or certified project designer.

E. Site Assessment and Pre-Cleaning

If structural deficiencies exist, they have to be corrected before the site can be prepared for paint-disturbing work (see Figures 8.3 and 8.4). Worksite preparation, resident, environmental, and worker protection is required to be provided if the structural repairs will involve disturbance of surfaces coated with lead-based paint.

If the paint is deteriorated and there are paint chips or dust or debris present, vacuum the floor before protective sheeting is laid down (see the next subsection). Vacuuming will prevent the paint chips from being ground into dust by the workers' feet. Wet cleaning usually is not required for pre-cleaning.

FIGURE 8.3 Structural deficiency.

FIGURE 8.4 Example of structural deficiency needing repair prior to work.

F. Vacuums: HEPA vs. non-HEPA

Vacuum cleaners used for cleaning up dust as a lead hazard control measure must be high efficiency particulate air (HEPA) vacuums if the work is covered by OSHA's Lead in Construction rule, EPA's RRP Rule, or HUD's LSHR. (See Appendix 6, and, in particular, 29 CFR 1926.62(h)(4), 40 CFR 745.85(b)(2)(A) and (B), and 24 CFR 35.145 and 150(b), respectively.)

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 of an inch.) See figure 8.5.

There is more to a vacuum than the filter. Other important factors that determine the effectiveness of a vacuum are velocity suction (which is a function of the motor, the design of the suction tool, and the extent to which the rest of the system does not release air before it is supposed to), quality of construction (which may determine the durability of the machine and whether there are air pressure leaks before the filtration), and whether the vacuum has special tools, such as a crevice tool. (See the further discussion of "Selecting a vacuum" in Chapter 11, section V.B.2.)

G. Worker Protection

Workers must be protected from exposure to lead by wearing protective clothing, practicing personal hygiene, and using lead-safe work practices (see Figure 8.6). Regardless of the size or dustiness of the job, OSHA requires that employers perform exposure monitoring of workers to determine the

FIGURE 8.5 One example of a commercial-type HEPA vacuum.

FIGURE 8.6 Inadequate worker protection during a large overhead paint stripping project. Depending on exposure, this worker should be wearing protective clothing, long chemical-resistant gloves and a respirator; and should also be protected against falls.

FIGURE 8.7 Placing coffee station in the work area is an unsafe work practice.

protective measures that are needed. Refer to 29 CFR 1926.62(g), Protective Work Clothing and Equipment, for specific requirements. These protective measures will help protect workers' families, because leaded dust will not be brought home, and will contribute to protecting the homes where they are working from lead contamination. Generally, protective clothing can include eye protection (always recommended), coveralls, head and hair protection (a painter's hat or a hard hat), disposable cotton gloves, latex/rubber gloves (when using detergents), disposable booties, and, if applicable, appropriate respiratory protection.

Personal hygiene includes the following "don'ts:"

- No smoking;
- No eating;
- No drinking (see Figure 8.7 for an unsafe work practice);
- No chewing; and
- No applying cosmetics in the work area.

Workers who perform these "don't" activities with lead on their hands put themselves at risk of ingesting lead. Workers should always wash their face and hands with soap and water before eating, drinking, or smoking and before leaving the site. Clothing should be changed before leaving the worksite. Tools should be cleaned.

Paint-removal practices described in Section II.D of Chapter 11 reduce the amount of dust created by the work and thus the likelihood of worker exposure. For complete information on worker protection, consult Chapter 9.

H. Lead-Safe Work Practices

Workers performing paint-disturbing work should use lead-safe work practices, in accordance with guidance at Section II.D of Chapter 11. Overall, this means that workers must never use prohibited paint-removal practices, should work wet to dampen dust spread (except where this would create an electrical safety hazard), and should clean up thoroughly after the work. During paint-disturbing work, painted surfaces should be wetted with a fine mist of water or water mixed with a surfactant before scraping or sanding to reduce generation of airborne paint dust, followed by wet HEPA vacuuming. Appropriate consideration should be given to potential electrical hazards that may be created by the presence of water. In addition, the occupant protection and worksite preparation measures described in this chapter are part of lead-safe work practices.

I. Debris Control

In general, see the discussion of debris control throughout Table 8.1, below.

In *occupied dwellings,* ensuring that cleaning of interior and exterior work areas is conducted as the work progresses and at the end of each work day or work shift is essential for conducting paint-disturbing work safely. Neither debris nor protective sheeting may be left outside the dwelling overnight or in any area where passersby, especially children, could come into contact with these materials. These practices prevent the spread of lead-contaminated dust. EPA's RRP rule requires dust to be contained at the end of each work day regardless of whether the dwelling is occupied.

These *Guidelines* additionally note that *continual 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. (See Section IV, Temporary Relocation, below.) When residents cannot be relocated and work is staged to proceed room by room, clearance standards may be more difficult to meet because dust from moved furniture may cause recontamination. In this situation, it is recommended that furniture be cleaned before moving it to an area where work and cleaning have been completed.

All debris is required to be handled and disposed of in accordance with the standards outlined in Chapter 10.

III. Worksite Preparation

A. Introduction

This section provides guidance on worksite preparation for interior and exterior paint-disturbing work, and it provides separate guidance for work on windows and for soil-lead hazard control. All recommendations in this section include the use of lead-safe work practices, including, most importantly, compliance with prohibitions against certain paint-removal practices described in Section II.D of Chapter 11.

The general purpose of worksite preparation is to minimize, contain, and control dust and debris created by the work. There are five objectives for worksite preparation:

- Protect residents and workers from exposure to lead in dust, paint chips, and other debris created by the work.
- Protect residents' belongings from contamination with lead.
- Leave the surfaces of dwellings and common areas free of dust-lead hazards.
- Protect the exterior environment, both on and off the subject property, from contamination.
- Protect adjacent homes from contamination.

The measures recommended in this chapter help protect workers from exposing themselves to lead in dust, contaminating their cars and homes, and endangering their children.

Factors affecting the worksite preparation measures needed for a specific job include the following:

- The amount and spread of dust likely to be created by the job, which in turn is affected by the size of the surfaces needing work; the location of the work (e.g., ceiling vs. lower wall); and the nature of the work and the methods being used. For example, the enclosure of walls may require a lower worksite preparation level than the wet scraping of a large area because enclosure will disturb less paint and generate less dust. Similarly, demolition associated with replacement of deteriorated components will probably require a higher containment level than the wet scraping of a small area.
- The amount of air movement in the work area.
- The location of residents.
- The building layout.
- The proximity of the building to other properties.
- The extent to which there will be other construction or abatement work (e.g., renovation or asbestos abatement) that will be concurrent or sequential with the work being planned.
- Worker protection needs may also be a factor.

EPA's RRP rule requires that dust not leave the work area. These *Guidelines* are performance-oriented and are not specifications. It is possible to devise a unique worksite preparation approach for an individual dwelling if it achieves the five objectives stated above and if clearance, if required, is achieved. Containment measures should be designed to prevent the release of lead-containing dust, which can be spread by workers' shoes or by airborne dust.

Whatever combination of containment measures is selected, the levels of lead in dust outside the containment area must not rise above clearance levels. A previously conducted risk assessment, or selective dust testing conducted for this purpose, will indicate if hazardous dust-lead levels exist outside the containment area. If dust-lead 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 farther than 10 feet away from the containment area, but this may vary if visual monitoring indicates that dust may have spread farther than 10 feet. If deviations from the worksite preparation plans described below are contemplated, then the performance of the containment system should be determined by a person certified in the State to collect dust samples. This flexibility permits owners to select the most cost-effective strategy while also protecting the public health and the environment.

B. Interior Worksite Preparation

These *Guidelines* provide, in Table 8.1, two sets of recommendations for *interior* work (not including windows) – one for "low-dust" jobs and one for "high-dust" jobs. (Recommendations for window work are provided in Section III.D, below.)

The approach of categorizing a project by the amount of dust it may generate ("high dust" / "low dust"), in order to describe suitable measures taken to protect the safety of the housing for each category, is analogous to the approach OSHA uses for characterizing worker exposures to lead and the suitable protective measures for workers taken for exposures in each worker airborne lead exposure range, although the residential protection "high" / "low" distinction is defined based on the spread of leaded dust, rather than the airborne dust levels, and is less quantitative.

A low-dust job is work that creates a small amount of dust that will not spread beyond 6 feet from the painted surfaces being disturbed. A high-dust job creates a large amount of dust that is expected to spread beyond 6 feet from the working surfaces. Work disturbing more than 10 square feet of painted surface per room is likely to be a high-dust job, while work that disturbs less than 10 square feet will probably be a low-dust job. These are very rough indicators, however. Dust spread depends on the elevation of the work surface, air movement, and whether methods are used to dampen dust dispersal as well as reduce the amount of paint being disturbed and the amount of dust being generated.

All work involving lead-based paint should be performed in a manner that minimizes all dust production. ***High-dust operations should be avoided if at all feasible***. All work should be designed to reduce all dust generation to protect children, workers and residents using work practices and procedures such as wet work practices and the use of tools with attached HEPA-vacuum exhaust.

Table 8.1 Interior Worksite Preparation (Not Including Windows)

Note: This table does not relieve employers from the exposure assessments and other requirements of OSHA regulations. For example, employers are responsible for determining whether a work area is at or above the Action Level or Permissible Exposure Limit for airborne lead, and undertaking any required engineering controls, administrative controls and personal protective equipment controls.

Description	Low-Dust Jobs	High-Dust Jobs (High-dust operations should be avoided if at all feasible.)
Typical Types of Work	A low-dust job creates a small amount of dust that will not spread beyond 6 feet from the painted surfaces being disturbed, depending on the type of work performed. Work that disturbs less than 10 square feet of painted surface per room will probably be a low-dust job, again depending on the type of work performed. The following tasks are also generally considered low-dust jobs: routine repairs, such as re-hanging doors, replacing or repairing door locks, patching small holes in walls, small electrical repair jobs, and routine repainting that involves a small amount of wet scraping and/or wet sanding for surface preparation. Enclosure and encapsulation may be low-dust jobs if little surface preparation and disturbance of paint is required.	A high-dust job creates a large amount of dust that is expected to spread beyond 6 feet from the working surfaces, depending on the job. Work disturbing more than 10 square feet of painted surface per room is likely to be a high-dust job. The following are also generally considered high dust-generating activities: demolition of painted surfaces, including removal of interior walls, paneling, baseboards, door casings or frames, cabinets, flooring, or ceilings; pulling up old wall-to-wall carpeting improperly (see Chapter 11); paint scraping of large areas, such as a whole room, even when done wet; using a circular or reciprocating saw on painted surfaces; and removing dry residue and paint after using chemical strippers.
Resident Location	Residents must be outside the rooms where the work will be done until after final clearance is achieved (or, if cleaning verification is being conducted, after the cleaning is verified), i.e., after results of dust sampling show that dust-lead levels are below applicable standards (or visual examination of the cleaning verification wipe indicates that the cleaning is verified). If the housing or the work is federally-assisted, the resident relocation provisions of HUD's Lead Safe Housing Rule (LSHR) must be followed. The LSHR requires residents to be temporarily relocated to a suitable, decent, safe, and similarly accessible dwelling unit that does not have lead-based paint hazards – see Section IV.B,	SAME AS FOR LOW-DUST JOBS, EXCEPT that HUD recommends temporary relocation of residents to a suitable, decent, safe, and similarly accessible dwelling unit that does not have lead-based paint hazards, for jobs lasting more than five consecutive calendar days even if neither the housing nor the work is not covered by the LSHR.

Description	Low-Dust Jobs	High-Dust Jobs (High-dust operations should be avoided if at all feasible.)
Resident Location (continued)	below, on how to determine if the relocation unit is acceptable – except in certain situations, including those below. It requires relocation of residents for jobs lasting more than five consecutive calendar days and has other requirements (See Appendix 6 and the LSHR at 24 CFR 35.1345(a)(2).). If residents are not being temporarily relocated, the worksite must be contained and the work and clearance or cleaning verification, if they will be conducted, will not be completed in one 8-hour work day, residents must have lead-safe access to sleeping areas, and bathroom and kitchen facilities. If bathrooms are not accessible, residents should be relocated, unless alternative arrangements can be made (e.g., use of a neighbor's bathroom). If construction will result in other hazards (such as exposed electric wires), then residents should be relocated. The dwelling unit and the worksite should be secured, and occupants' belongings protected from contamination.	
Containment and Barrier Systems	To catch dust, paint chips, and other debris created by the work, place a single layer of impermeable protective sheeting (e.g., plastic) on the floor extending at least 6 feet out in all directions from each painted surface being disturbed. Workers should extend protective sheeting farther if they think dust generated by the work will spread, or in fact is spreading, beyond 6 feet. When dust and debris spread beyond 6 feet, workers should follow high-dust methods, depending on the job. If work on the flooring is part of the job, it is generally not necessary to put protective	Place two layers of protective sheeting on the entire floor of rooms where work is being done, in passageways used by workers going to and from the work area, and other areas used for storage of tools or debris. Two layers of protective sheeting should be used for all jobs in which damage to the sheeting is likely. (See Figure 8.8.) Usually the top sheet will be damaged and the bottom sheet will protect the floor. Torn or punctured sheeting should be repaired each day. Protective sheeting on floors should be a heavy-duty, disposable, impermeable

Description	Low-Dust Jobs	High-Dust Jobs (High-dust operations should be avoided if at all feasible.)
Containment and Barrier Systems (continued)	sheeting on the floor if the non-floor work is low dust. Protective sheeting on floors should be a heavy-duty, disposable, impermeable covering, such as polyethylene or vinyl plastic sheeting to resist tearing or puncture during the work. Plastic sheeting of 6 mils thickness is generally recommended for floors, but a thinner grade may be satisfactory for jobs of short duration with light traffic and no abrasion. Adhesive-backed floor protection films may be useful. Protective sheeting on floors must be able to withstand vacuuming the work area. Do not use cloth canvas drop cloths; they can transfer retained leaded dust from job to job. Do not track dust off the protective sheeting onto unprotected flooring. Workers and others leaving the work area must clean themselves before they do in order not to track dust off of plastic sheeting. Wear disposable non-skid shoe covers ("booties") when on protective sheeting and remove them each time you step off the sheeting. Alternatives to using booties are: (1) wipe both the top and bottom of your shoes with a damp paper towel each time you step off the sheeting;  **FIGURE 8.8 Floor plastic in work area.**	covering, such as polyethylene or vinyl plastic sheeting of 6 mils or greater thickness to resist tearing or puncture during the work. . Adhesive-backed floor protection films may be useful. Protective sheeting on floors must be able to withstand vacuuming. Workers and others leaving the work area must clean themselves before they do in order not to track dust off of plastic sheeting. Lighter impermeable sheeting, such as "painter's poly," may be used to protect immovable objects within the work area. Do not use cloth drop cloths; they can transfer retained leaded dust from job to job. If only a few rooms in a dwelling unit are being treated, install protective sheeting with a simple airlock flap on doorways to avoid having to clean and clear the entire dwelling. Even if the entire dwelling is to be cleaned and cleared, it is helpful to install protective sheeting in doorways to work areas to reduce the spread of dust. Simple airlocks are constructed using two sheets of protective sheeting. The first one is taped on the top, the floor, and both sides of the doorway with a vertical fold in the middle to allow slack. 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, placed on the side of the first sheet facing the work area, across the top of the door only, so that it acts as a flap. The flap should open into the work area. (See illustrated guidance on this method in the *Lead Paint Safety Field Guide* (HUD, 2001), page 46.) Doorways within a containment area need not be sealed if the work area is isolated from the rest of the unit. If the entire dwelling unit is being treated, cleaned and cleared, doorways need not be sealed.

Description	Low-Dust Jobs	High-Dust Jobs (High-dust operations should be avoided if at all feasible.)
Containment and Barrier Systems (continued)	(2) clean the bottom of your shoes using a tack pad (a large sticky pad that is taped to the protective sheeting and helps remove dust) every time you step off the sheeting; and (3) remove shoes every time you step off the protective sheeting. The drawbacks to these alternatives are: (1) heavily treaded work boots may be difficult to clean; (2) the effectiveness of the tack pad may become compromised after a period of use; and (3) going without shoes in non-work areas is risky to the feet. A physical barrier should be placed at doorways to prevent inadvertent access by residents. If the work and collection of clearance dust samples will not be completed in one day, there should be an overnight barrier that is locked or firmly secured to prevent access to rooms where work is being done (see Figure 8.9). Children should not have access to protective sheeting because of the suffocation hazard. All personnel, tools, and other items, including the exteriors of containers of waste, must be kept free of dust and debris before leaving the work area.  **FIGURE 8.9 Plastic barrier between living space and work area.**	Place protective sheeting on the floors of passageways to be used by workers going from high-dust work areas to the outside. This facilitates daily cleanup of the work areas and encourages workers to use the protected passageways. Do not track dust off the protective sheeting onto unprotected floor. Wear disposable non-skid shoe covers ("booties") when on protective sheeting and remove them each time you step off the sheeting. Alternatives to using booties are: (1) wipe both the top and bottom of your shoes with a damp paper towel each time you step off the sheeting; (2) clean the bottom of your shoes using a tack pad (a large sticky pad that is taped to the protective sheeting and helps remove dust) every time you step off the sheeting; and (3) remove shoes every time you step off the protective sheeting. The drawbacks to these alternatives are: (1) heavily treaded work boots may be difficult to clean; (2) the effectiveness of the tack pad may become compromised after a period of use; and (3) going without shoes in non-work areas is risky to the feet. If the work and clearance will not be completed in one day, there should be an overnight barrier that is locked or firmly secured to prevent access to rooms where work is being done. Children should not have access to protective sheeting (suffocation hazard). All personnel, tools, and other items, including the exteriors of containers of waste, must be kept free of dust and debris before leaving the work area.

Description	Low-Dust Jobs	High-Dust Jobs (High-dust operations should be avoided if at all feasible.)
Warning Signs	If residents are present, place warning signs at the entry to work-area rooms or the containment area and at each main and secondary entryway to the building or, for work in multi-family housing, the unit; if the work is to be done in a common area, place the warning signs at the entries to that area (see Figure 8.10 and 11). Warning signs should be in the language(s) understandable to residents and workers. Recommended wording is: "Warning. Lead Work Area. Poison. No Smoking or Eating." Wording can be adapted as appropriate to project-specific conditions. The EPA's RRP rule has sign requirements for renovations (see Appendix 6). OSHA warning signs are required when worker exposures exceed OSHA's permissible exposure limit for airborne lead; see Chapter 9.  **FIGURE 8.10 Interior warning sign.**	SAME AS FOR LOW-DUST JOBS.  **FIGURE 8.11 Exterior warning sign for project shown in Figure 8.10**

Description	Low-Dust Jobs	High-Dust Jobs (High-dust operations should be avoided if at all feasible.)
Ventilation	To contain dust, air movement should be minimal in work areas while painted surfaces are being disturbed and while cleaning is being conducted. Fans should be turned off, and windows should be closed. The HVAC system should be turned off. Forced-air duct vents within the work area of surfaces being treated and at least 6 feet beyond should be covered with protective sheeting and taped. Doorways in the work area must be closed, and covered with plastic sheeting or other impermeable material. (If volatile substances are to be used, such as certain types of paint strippers, a source of fresh air should be provided and manufacturer's instructions followed in order to ensure protection of the workers. Open windows usually are the available source of fresh air. An alternative source of fresh air to open windows is negative air; see Section V, below. If windows are to be opened, then, in order to minimize dispersal of leaded dust, open as few windows as need be to protect the works, use high-dust containment methods (see above), and conduct the work with the volatile substances first followed by other paint-disturbing work with the windows closed.) Painting can be done with windows open and HVAC system on, provided the work has passed clearance or cleaning has been verified, and paint fumes will not be carried to other areas causing danger or discomfort.	SAME AS FOR LOW-DUST JOBS.

Description	Low-Dust Jobs	High-Dust Jobs (High-dust operations should be avoided if at all feasible.)
Furniture and Resident's Belongings	Remove drapes, curtains, furniture, rugs, and other resident belongings from the work area, that is, to at least 6 feet away from surfaces being treated, and cover and seal with taped impermeable protective sheeting all large furniture and other large items that cannot be moved (see Figure 8.12). If there will be air movement due to open windows, remove all belongings from rooms in which work is being done or cover and seal with taped protective sheeting.	SAME AS FOR LOW-DUST JOBS.  **FIGURE 8.12** **Items that are too large to move should be sealed completely and taped.**
Cleanup	**Daily cleanup:** The purposes of daily cleanings are: (1) to help assure that workers will not be exposed to accumulated dust-lead; (2) to make it more likely that the work area will pass the initial clearance examination after one final cleanup; and (3) to protect residents after final cleanup. If residents are present in part of the dwellings, daily cleaning provides protection against accidental resident exposure, especially after work hours. The longer the job lasts, the more important the daily cleaning. The "daily" procedures below apply to each work shift if the work is being done on more than one shift. Daily cleaning includes: (1) wrapping or bagging debris and storing same in a secure area; (2) vacuuming (using HEPA vacuums throughout) protective sheeting on floors and belongings; (3) vacuuming other horizontal surfaces within at least 6 feet of treated surfaces; (4) vacuuming and wet cleaning of floors used as passageways to the work areas (except that wet cleaning is not necessary if passageways can be reliably secured during non-work hours) any	NEARLY THE SAME AS FOR LOW-DUST JOBS, except that cleaning of horizontal surfaces should extend through the entire containment area, not just within 6 feet of the work surfaces.

Description	Low-Dust Jobs	High-Dust Jobs (High-dust operations should be avoided if at all feasible.)
Cleanup (continued)	areas used for storage of tools and debris; and (5) patching and repairing of protective sheeting and simple airlock flaps as needed. Contaminated objects need to be properly wrapped before removing from the work area (see Figure 8.13). Do not store dust, debris and other waste inside the dwelling overnight. Instead, transfer the waste to a locked secure area or container that prevents release of, and access to, dust and debris. **Final cleanup:** The final cleanup includes: (1) cleaning and removal of protective sheeting from the floor and belongings and discarding of same; (2) vacuuming and wet cleaning all horizontal surfaces (including window troughs) within at least 6 feet in all directions of all disturbed painted surfaces (cleaning beyond the 6 feet perimeter is recommended as a safety precaution if dust generated by the work may have spread beyond 6 feet); (3) cleaning all window troughs; and (4) vacuuming and wet cleaning the floor in adjacent areas used as pathways to the work areas. See Chapter 14 for further guidance on cleaning before, during, and after hazard control and other paint-disturbing work.	 **FIGURE 8.13 Removal and wrapping contaminated carpet.**
Monitoring Effectiveness of Containment	The project supervisor must make sure that dust generated by paint-disturbing work has not spread beyond the containment area. Conduct visual monitoring while paint-disturbing work is underway and while workers are stepping off the protective sheeting on the work-area floor. Checking the quality of the effectiveness of containment is optional for low-dust jobs but is encouraged for low-dust jobs lasting longer than 5 consecutive days. (If the quality check is to be conducted, see the procedures for high-dust jobs.)	The project supervisor must make sure that dust generated by paint-disturbing work has not spread beyond the containment area. Conduct visual monitoring while paint-disturbing work is underway and while workers are stepping off the protective sheeting on the work-area floor. HUD recommends that the project supervisor (certified renovator) check the quality of the effectiveness of containment of high-dust jobs as follows:

Description	Low-Dust Jobs	High-Dust Jobs (High-dust operations should be avoided if at all feasible.)
Monitoring Effectiveness of Containment (continued)		✦ For high-dust jobs scheduled to be in containment for up to 5 consecutive days: — Supplement the project oversight with cleaning verification. — Specifically, at the end of *each* work day (or work shift if the work is being done on more than one shift), perform the cleaning verification of the floor of the living area outside the containment that is at greatest risk of contamination (usually the living area closest to the work area). ✦ It is essential that the cleaning verification be performed before daily cleaning to determine if the containment system was effective in protecting the occupants that day. ✦ For high-dust jobs scheduled to be in containment for more than 5 consecutive days, or turns out to take that long: — Supplement the project oversight with dust-wipe testing. — Specifically, a dust-wipe sample should be collected at the end of *each* work day (or work shift if the work is being done on more than one shift) from the floor of the living area outside the containment that is at greatest risk of contamination (usually the living area closes to the work area). ✦ It is essential that the sample be collected *before* daily cleaning to determine if the containment system was effective in protecting the occupants that day, and

Description	Low-Dust Jobs	High-Dust Jobs (High-dust operations should be avoided if at all feasible.)
Monitoring Effectiveness of Containment (continued)		that the location of the sample not be known in advance to the person(s) or firm(s) conducting the job. — Sampling, analysis and use of dust tests. ✦ Samples for this purpose should be collected by a certified risk assessor, lead-based paint inspector, or sampling technician. The wipe sample should be collected in accordance with Appendix 13.1, or similar protocol. ✦ Dust-wipe samples should be sent to a laboratory recognized for analysis of lead in dust by the National Lead Laboratory Accreditation Program (NLLAP) (or an EPA-authorized State/ Tribal-required alternative). One-day service (or faster, if desired to expedite the project) should be ordered. ✦ Lead levels in the floor dust should be less than the applicable floor dust standard for clearance (the Federal standard as of the publication of this edition of these *Guidelines* is 40 µg of lead per square foot). ✦ If the dust-lead level is above clearance standards or if the cleaning is not verified, the person in charge should immediately: — Clean the areas represented by the failed clearance testing or cleaning verification.

Description	Low-Dust Jobs	High-Dust Jobs (High-dust operations should be avoided if at all feasible.)
Monitoring Effectiveness of Containment (continued)		— Review all elements of the worksite preparation and occupant protection for the job, make improvements where feasible (e.g., repairing torn contaminant barriers), and reaffirm strict compliance by all workers with lead-safety procedures. — If dust-lead levels are found to exceed the clearance standard a second time, residents must be relocated and must not be allowed to reenter the dwelling until final cleanup and documented compliance with clearance standards or cleaning verification is achieved. ✦ If a work-crew supervisor (certified renovator) can document that the containment is effective (that is, for the area outside containment that was checked, the wipe sample is below the dust-lead clearance standard, or the area passed cleaning verification) for 3 or more consecutive dwelling units in which the work crew used the same hazard-control techniques on high-dust jobs, then the frequency of checking high-dust jobs can be reduced to 1 in every 10 dwelling units for that supervisor.

C. Worksite Preparation for Exterior Paint-Disturbing Work

For exterior paint-disturbing work, worksite preparation is dependent on several factors: the amount of dust created; how high up the work surfaces are; how near the work surfaces are to other properties; weather conditions; the location of the residents; and whether people must pass in and out of the building during the work. A porch, balcony, or deck is considered to be exterior, unless it is enclosed by screens or windows, in which case it is considered to be an interior room for the purpose of worksite preparation. Only one set of instructions is provided because the same approach is used for low-dust and high-dust exterior jobs.

1. Resident Location

Residents may remain inside dwellings outside of which exterior work is being done, but must be away from the work area for the duration of the exterior project until final cleanup and exterior clearance have been completed. Alternatively, residents may leave their dwellings during workdays and return to the interior (not the exterior work area) after daily cleanup at the end of each workday (presuming the work is done during just the day shift), or residents may temporarily relocate for the duration of the project. Remaining residents must have lead-safe access to entry/egress pathways. (For longer-duration HUD-assisted interior work, the Lead Safe Housing Rule (LSHR) requires that residents be relocated; see Section IV, Temporary Relocation, below, Appendix 6, and the LSHR at 24 CFR 35.1345(a)(2).)

Workers should tightly close or seal windows, doors, and other building openings within 20 feet of surfaces being disturbed during exterior work. Remaining residents should be instructed not to open windows within 20 feet of ongoing work. Daily cleanup of horizontal surfaces within 20 feet of disturbed surfaces is essential.

2. Containment and Barrier System

Place one layer of disposable impermeable plastic (not landscape fabric, geotextiles, or cloth) protective sheeting (typically at least 6 mil thick to resist tears) on the ground, weighted down by heavy objects, and extending far enough from the work surfaces to adequately collect all falling paint chips and debris. EPA's RRP rule requires that the sheeting extend at least 10 feet in all directions beyond working surfaces when work is on the ground floor, or a sufficient distance to collect falling paint debris, whichever is greater, if feasible; these criteria are also appropriate for abatement work. As a general guide, if work is above the ground floor, sheeting should extend 20 feet. These distances apply unless an adjacent building or other obstacle interferes (see Figure 8.14, and the following paragraph). Being up high and exposed to wind currents, dust created by scraping an exterior above the ground floor has the potential to contaminate a large area. Scaffolding with vertical shrouding or staging on pump jacks are other options. Vertical shrouding on scaffolding generally should be used if work is close to a sidewalk, street, or another property, or if work will be conducted at a height of more than three stories.

If an adjacent building, building wing, or property line is closer than the distance the sheeting should extend (10 feet or 20 feet, as applicable), provide as much protection as feasible. For example, if the adjacent building is on the same property as project building, or is owned by the same owner, protective sheeting should be placed on the facing side of the adjacent building within 10, or 20, feet of the work area, as described above.

FIGURE 8.14 Exterior containment of polyethylene sheeting lines the narrow walkway between two houses. Notice the abatement worker in the background.

FIGURE 8.15 Exterior containment on building and window; ladder kept on plywood.

(See figure 8.14) If the adjacent building is owned by another owner, an effort should be made to coordinate with that owner to allow protective sheeting to be installed on that owner's ground and building.

Tape and/or staple protective sheeting to wood siding or ribbon board so there are no gaps between sheeting and building. A wood strip may have to be attached to a masonry wall. Build a curb at the edge of the protective sheeting to prevent contaminated runoff and reduce blowing of debris off the sheeting. If power washing is planned, extra care is needed to contain runoff. Weigh sheeting down with two-by-fours or similar objects. In hot weather, take care not to burn out vegetation under plastic sheeting. White plastic is less harmful than black or clear. Do not place ladder feet on top of plastic sheeting. Cut slots in the sheeting and place ladder feet on the ground and repair slots with tape when the ladder is moved. Alternatively, place a large, sturdy piece of plywood on the sheeting and put the ladder on the plywood (see Figure 8.15). If power washing is planned, a certified abatement supervisor with experience with such methods should design special containment and water-collection measures.

Keep all windows, doors, and other building openings within 20 feet of working surfaces (including openings in adjacent buildings) tightly closed or sealed with protective sheeting unless entry to the interior is needed. If possible, require use of an alternative entryway for existing entryways closer than 20 feet. If an entrance must be used that is closer than 20 feet, place a shroud above and on the sides of the entrance and install a simple airlock flap at the door (see the Containment and Barrier Systems row of Table 8.1, above). In addition, install a tack pad inside the door so shoes can be cleaned off.

If residents are remaining in the dwellings or returning at the end of the day, at least one lead-safe entryway must be made available. Do not work on front and rear porches at the same time unless there is a third entry.

3. Playground Equipment, Toys, Sandbox, and Outdoor Furniture

Remove all movable items to at least a 20-foot distance from working surfaces. Items that cannot be readily moved to a 20-foot distance must be sealed with taped protective sheeting.

4. Security

Erect temporary fencing or barrier tape at a 20-foot perimeter around working surfaces (or less if distance to the next building or sidewalk is less than 20 feet). If practical, require use of an alternative entryway for any entrance within 20 feet of working surfaces. If not, install a shroud, simple airlock flap, and tack pad, as described above. Use a locked metal bin, locked covered truck, or locked room to store debris securely before disposal.

5. Warning Signs

Post warning signs on the building and at a 20-foot perimeter around the building (or less if distance to next building or sidewalk is less than 20 feet). Warning signs should be in a language understandable to residents (see Figures 8.10 and 8.11). Recommended wording is: "***Warning. Lead Work Area. Poison. No Smoking or Eating.***" Some states have specific sign requirements, and wording can be adapted as appropriate to project-specific conditions. See EPA's RRP rule for sign requirements for renovations. You may also use barrier tape (see Figure 8.16).

If an employee's exposure to lead is above the permissible exposure limit (PEL) of 50 µg/m³ of airborne lead averaged over an 8-hour period, warning signs must be posted at in each work area. The mandatory language for these signs is shown in Chapter 9, Section III.

FIGURE 8.16 Example of barrier tape used as an occupant protection measure.

6. Weather

Do not conduct exterior work if wind speeds are greater than 20 miles per hour or if dust and debris cannot be adequately contained. If chips and debris are blowing off the protective sheeting, work must stop until the wind dies down or adequate containment is installed. In the meantime, cleanup must occur before rain, snow or other precipitation begins.

7. Cleanup

Cleanup should be conducted at the end of each workday, the end of each work shift when work is being done on more than one shift, or when workers are finished in one exterior work area and moving to another, whichever is soonest.

- ✦ Remove debris and paint chips and wet clean all horizontal surfaces on the building (e.g., exterior window sills and exposed window troughs, porches, balconies, railings) within 20 feet from working surfaces.
- ✦ Remove debris and paint chips from the protective sheeting.

- Dispose of water that has collected on the protective sheeting in accordance with local rules (usually flushing it down a toilet is acceptable, but do not dump it down a storm drain or a sink, tub, or shower).
- Clean (either vacuum or wet clean) the protective sheeting.

After cleaning:

- Fold protective sheeting inward to avoid contamination of the environment. Do not reuse protective sheeting.
- Visually inspect for and remove any debris and paint chips from the ground, walkways, gardens, shrubbery, and play areas. Refer to Chapter 14 for further guidance on cleaning before, during, and after hazard control and other paint-disturbing work.
- Do not leave debris or protective sheeting out overnight (or after the final work shift of the day).
- Keep all debris, protective sheeting, and other disposable material in a secured area that will not allow release of the material, until final disposal. (See Section III.C.4, above.)

D. Worksite Preparation for Windows

Because windows have both interior and exterior sides, workers should protect both interior and exterior spaces from contamination when repairing or replacing old windows or performing interim controls or abatement of lead-based paint hazards on windows. Most window repair and window interim control work can be considered low-dust work if paint surfaces are misted before being scraped and prepared for repainting, and scored before removing small parts like stops and parting beads. However, if the entire window, including the jamb casing, stool, and apron, is being replaced, workers should prepare for high dust generation.

FIGURE 8.17 Pre-cleaning window with HEPA vacuum.

An important consideration in planning dust containment for window work is that the windows may be open during most of the work, creating the potential for wind-blown dust into the interior. Therefore, workers should follow the guidance given in Table 8.1 for interior worksite preparation that protects against wind-blown dust, if window openings are not closed, either by closing the storm window, if present and operable, or by covering the opening with protective sheeting (see Figure 8.17), or if the work is such that the window will not be opened, such as if it is for repair of paint on the underside of the interior sill (see Figure 5.14) or the face of the window frame.

If working on windows from the outside, it may be possible to tack or tape protective sheeting to the interior window casing or wall, completely covering the window opening, and achieve sufficient interior worksite protection. If the interior of the unit is adequately protected, the interior would not need to undergo a clearance examination. Care must be taken in preparation, because attaching sheeting to the interior wall may cause unacceptable damage to the wall surface unless appropriate tape, such as blue painter's tape, is used.

If the window is not sealed to the interior of the unit before it is removed from the outside, interior cleanup and clearance would still be necessary. Also, exterior worksite preparation, as described in Section III.C, is always required for window removal from the outside, and the protective sheeting must be removed and disposed of with care.

Workers should follow other guidance provided in Table 8.1, above, for resident location, barriers, signs, security, ventilation system, furniture protection, weather, cleanup, and clearance.

If working from the inside and there is no operable storm window, workers may be able to tack and tape protective sheeting to the outside window surround or wall, completely covering the window opening, so that dust and debris will not fall on exterior surfaces other than the window sill. If there is an operable storm window, workers may either install the sheeting as described above, or put tape across the gaps between the storm window sashes and frame, and between storm window sashes. This will preclude the blowing of dust into the interior, and it will also provide adequate protection of the exterior so further exterior worksite preparation may not be necessary. (Of course, the protective sheeting must be removed and disposed of with care, and exterior cleanup and visual assessment for dust, debris and residue should still be done.) If this method is not used, the interior and preparation based on either low- or high-dust generation, as appropriate, and protecting against wind-blown air. As noted in Section III.B and Table 8.1, high-dust operations should be avoided if at all feasible; planning for window replacement projects should include sufficiently stringent precautions and controls to minimize the likelihood of the project becoming a high-dust project.

E. Worksite Preparation for Soil-Lead Hazard Controls

Disturbing lead-contaminated soil poses the risk of generating dust that can contaminate building surfaces, both interior and exterior, and adjacent yard and paved areas. The most effective way to reduce dust generation is to continually dampen the soil as it is being disturbed. This should always be done. However, workers should take care not to over-water the soil. Excessive dampening of the soil is likely to cause runoff and require the use of major curbing methods, such as bales of hay.

If the soil-lead hazard control method being used involves minimal disturbance of the bare soil (as may be the case when the soil is covered with bark, mulch, sod, gravel, landscaping fabric, paving stones, or asphalt paving) and if the soil is kept damp during the work, adequate worksite preparation is to place protective sheeting on ground surfaces, porches, etc. within at least 6 feet of the work area on all sides and to tightly close or seal all building openings within at least 10 feet. These distances are minimum guidance. Supervisors should visually monitor dust spread and adjust the containment if needed during a particular project.

If, however, the soil is being shoveled, cultivated, rototilled, or otherwise subjected to major disturbance, protective sheeting on the ground should extend at least 10 feet from the soil, and all building openings within 20 feet of the work area should be tightly closed or sealed. Of course, this should be accompanied by periodic dampening of the soil during the work.

Perform daily and final cleanup. Follow the cleanup guidance for exterior paint-disturbing work (see Section III.C.7, above), except, of course, references to paint chips apply only if the soil was visibly contaminated with them.

IV. Temporary Relocation

Temporary relocation means that occupants currently living in a dwelling intend to return to that unit once the work is finished. There are many possible variations – from requesting residents to vacate the unit for just one workday (leaving their belongings in the unit and returning at the end of the day) to moving everything out for several weeks or months. Temporary relocation of residents can be disruptive, complicated, and costly. Careful planning of relocation pays off in good client relationships, cost containment, and efficiency in conducting the work. This section provides answers to some of the most common questions about relocation.

A. When Is Relocation Necessary and What Are the Options?

Temporary relocation of residents is generally recommended when work is undertaken that will disturb painted surfaces known or suspected to contain lead-based paint and the work will occur throughout much of the dwelling over several days. (If the work does not disturb lead-based paint, dust-lead hazards or soil-lead hazards, relocation is usually not necessary as a lead-exposure protection measure.) Temporary relocation is clearly necessary if residents cannot have safe access to bathrooms, sleeping areas, and kitchen facilities (or alternative eating arrangements) during non-work hours.

Safe access includes the absence of other significant safety, health, or environmental hazards in addition to lead hazards (e.g., toxic fumes, on-site disposal of hazardous waste, or exposed electrical wiring).

There are, however, several exceptions and options that may be considered in deciding whether it is necessary for residents to temporarily relocate and, if so, for how long and whether furniture and other belongings must be moved.

1. Work Is a Small Area

If only a small amount of paint is being disturbed, that is, an amount below HUD's *de minimis* threshold for HUD-assisted projects, or EPA's minor repair and maintenance work threshold for unassisted projects, special measures to protect residents from exposure to leaded dust are not required (see Section II.A, above, for a definition of the HUD and EPA area threshold definitions). However, basic precautions are strongly recommended. These include: never using prohibited paint-removal practices (see Chapter 11, Section II.D.1), and cleaning the work area thoroughly after work is completed. Also, if a child under age 6 resides in or accesses the unit or area, keep residents out of the work area until after final cleanup.

2. Work Is Only on the Outside

Residents and their belongings may remain inside the dwelling if the work is only on the exterior and building openings (windows, doors, vents) within 20 feet of disturbed paint surfaces are tightly closed or sealed and cleaned afterward, *and* an entryway is provided that is free of dust-lead hazards, soil-lead hazards, and debris.

3. Work and Clearance Take Only One Day

If the work, final cleanup, and clearance can be achieved (i.e., results of dust sampling received from the laboratory and found to be acceptable) in one work day, residents need to be out of

the work area or the unit only for that day and can return with full access to the unit at the end of the day. As a practical matter, however, completion of the work and achievement of clearance in one day may not be a realistic goal. It usually takes an additional day to get the results of the laboratory analysis. However, as discussed in Unit IV.E, below, methods (including portable X-ray fluorescence (XRF) analysis and anodic stripping voltammetry) exist for reliably analyzing wipe samples on-site instead of in a fixed laboratory, which may provide testing results much more quickly than fixed-laboratory analysis by avoiding transportation of the samples to the laboratory and handling time within the laboratory. A laboratory that is recognized under NLLAP for mobile source lead dust analysis may be used for clearance. This approach may be particularly helpful for multi-family projects, in which a work crew may be working on a unit while the clearance test analysis is being performed on the crew's preceding unit. Sometimes work areas do not pass clearance the first time, so recleaning and additional dust sampling is required, which may require an additional day, even if the dust-lead analysis is rapid.

4. Work Area Is Limited and Work Is of Short Duration

Relocation is usually not necessary or is necessary only for workday hours if the work: takes less than five days; is being conducted in only one or two rooms; and if exclusion from those rooms does not preclude safe resident ingress and egress to the unit and safe access to kitchen (or alternative eating arrangements), bathroom, and sleeping areas. Furniture and other belongings can be moved out of the workrooms, or covered and sealed with protective sheeting and tape. It is recommended, however, that residents who remain in their units or vacate only during workday hours while such limited area work is being conducted be required to sign a statement that: (1) they understand that there may be lead-based paint hazards in both specified work areas and traffic areas used by workers outside the work areas in spite of a thorough cleaning of such areas; and (2) they agree not to enter the work areas until they are notified by a specified responsible party that the areas have passed clearance (or cleaning verification, if applicable).

Theoretically, such arrangements, in which residents remain in the unit or are absent during the workday but return for the night, can continue for an extended period of time. As a practical matter, however, there are limits to how long people will comply with such procedures. **HUD regulations pertaining to housing receiving Federal assistance for the residents to live there or for the work allow this type of arrangement to continue for no more than five calendar days (24 CFR 35.1345(a)(2)(iv))**. If residents are to be allowed back in the unit during the night, it is necessary that workers thoroughly clean, at the end of each work day, not only the work areas but also the floors of the pathways used by workers to and from the work areas. Installing protective sheeting on these pathways facilitates cleaning. If a decontamination area is used in a large multi-family project, cleaning is necessary only from the work areas to the decontamination area.

5. Exception for Elderly Residents

Because of the added difficulties that may accompany the relocation of elderly residents, it is acceptable to make special exceptions to normal relocation policy for them. This exception is acceptable for work to be done in housing for the elderly. (As stated in the Lead Safe Housing Rule, housing for the elderly means retirement communities or similar types of housing reserved for households composed of one or more persons 62 years of age or more, or other age if recognized as elderly by a specific Federal housing assistance program; it is not merely housing occupied by the elderly.) If elderly residents are permitted to stay in their units when temporary relocation would normally be required, they should be fully informed about

the nature of the work and the hazards that may be generated; they should be required to sign an informed consent form before the work begins; and, of course, children should not be permitted in the unit. If the resident declines to sign, the property owner and the contractor will have to determine whether or not the job will be performed. Figure 8.18 is an example of an informed consent form. **No such policy or form should be implemented without advice from the contractor's legal counsel.**

Figure 8.18 Sample Informed Consent Form for Residents of Housing for the Elderly.

I/We, the undersigned,

☐ choose to remain in my/our home while _____
(Description of work)
is being performed;

or

☐ choose to relocate to another unit while the work is being performed;

and

☐ I/We have made this choice having read and understood the following:

1. I am/At least one of us is at least 62 years old.
2. My/Our home was built before 1978 and is housing designated for the elderly.
3. I/We have received the pamphlet *"Protect Your Family From Lead in Your Home"* and the pamphlet *"Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools"* (*"Renovate Right"*), and am/are aware of the health hazards that are posed by lead-based paint in general and that can be created by renovation, painting, repair or lead abatement work
4. I/We have been given a description of work that will be done in my/our home and understand that during the course of the work, lead hazards may be created in the work area. These hazards will be taken care of before the job is considered complete.
5. I/We may stay in my/our home but I/we may not enter the work area while work is being performed.
6. I/We will not allow children under age six or women of childbearing age to visit or reside in my/our home while work is being done, because visiting or residing may pose a health risk.
7. I/We waive rights to all damages. I/We agree to hold harmless

   _____
   (The housing owner, public housing agency, or other responsible party)

   for any damages due to lead poisoning that occur as a result of the work on these premises.

_____ _____ _____ _____
Name Date Name Date

B. What Relocation Units Are Acceptable?

Relocation dwellings should be acceptable to residents so that they will not attempt to return to their own dwellings during paint-disturbing work. Generally, dwellings serving as temporary relocation units should, at minimum, meet applicable housing codes. If they are HUD-assisted, they should meet the regulatory standards, e.g., housing quality standards (24 CFR 982.401) or physical condition standards (24 CFR 5.703). If they were constructed before 1978 and are not HUD-assisted, they should also pass a visual assessment; that is, they should have no deteriorated paint and no visible dust or debris. If a dwelling constructed before 1978 is to be occupied by a relocated household for more than 100 days or if it is used repeatedly for temporary relocation (such as a lead-safe unit operated by a community program) with occupancy periods totaling more than 100 days, it should be found to be lead-safe by a risk assessor before the first occupancy begins, and at least annually thereafter. In addition, these units should be adequately equipped with furniture, cooking facilities, refrigerators, televisions, and toys (except for items that will be moved with the residents). 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. Destination options include staying with relatives or friends, a designated relocation unit owned or leased by a local organization, a hotel or motel (usually the most costly and least desirable option for families with children), or a temporarily vacant unit in the same multi-family property. If the Lead Safe Housing Rule requires relocation of the family to a temporary unit during work, the unit to which the family is relocated must not have lead-based paint hazards (24 CFR 35.1345(a)(2)).

C. Allowing Reoccupancy after Interim Clearance

In some rehabilitation jobs, it may be efficient to conduct all lead hazard control or abatement work first, using qualified firms and workers, and then, following a preliminary or "interim" clearance (see Chapter 15 for details), conduct other rehabilitation work that will not affect lead-based painted surfaces with firms or workers who are not certified for lead hazard control work or renovation work that may affect lead-based painted surfaces. Clearance is conducted after the hazard control or abatement work to document that the contractor has completed the job correctly. This clearance is sometimes called "interim clearance." The question may arise in such cases whether temporarily relocated residents can return after interim clearance is achieved but before all rehabilitation is finished. The general answer depends on the nature of the post-clearance rehabilitation work and how much dust will be created. Additional guidance is provided below. However, for units controlled under HUD's Lead Hazard Control grant program, and some local regulations, units in which rehabilitation work occurs following lead hazard control must pass a final clearance prior to re-occupancy by the residents (see the HUD Office of Healthy Homes and Lead Hazard Control's Policy Guidance 99-01, posted at: ***http://portal.hud.gov/hudportal/HUD?mode=disppage&id=POLICY_GUIDANCES***).

Most rehabilitation activities generate a lot of dust. In old houses, such dust may be contaminated with lead even if the components being disturbed are not coated with paint that is considered lead-based paint under Government regulations. There are two reasons for this: (1) existing paint that is not lead-based paint can still contain lead; (2) dust under or behind floors or walls can be contaminated from accumulations that are decades old. Therefore, in old homes that have been found to contain lead-based paint hazards, it is recommended that there be a final clearance after all paint-disturbing work is

finished, even if there was an interim clearance previously and the follow-up work did not disturb lead-based painted surfaces. For this reason, it is recommended that relocated residents usually not return until after all paint-disturbing work is completed and final clearance is achieved.

If, however, the paint-disturbing work performed after interim clearance will disturb less than a *de minimis* amount of paint (see Section II.A, above), final clearance is not necessary and residents can return after the interim clearance. If the paint being disturbed exceeds the *de minimis* but is known not to be lead-based paint, residents can return. But in each case, i.e., if the *de minimis* applies or if the paint is not classified as lead-based paint, the precautions listed at the end of Section II.A, above, should be followed when disturbing paint in pre-1978 housing, unless it is known that all layers of disturbed paint have been applied after 1977: (1) never use the prohibited methods of paint removal that are described in Section III.C.1 of Chapter 6, or Section II.D of Chapter 11, and (2) when disturbing paint *in housing occupied by children of less than 6 years of age,* clean the work area thoroughly after finishing, preferably with a HEPA vacuum and wet cleaning, and always keep residents out of the work area while work is underway and until after the unit has passed clearance.

The approach above also applies to work that is not being cleared but is having its cleaning verified, that is, the work is covered by EPA's RRP Rule but not HUD's Lead Safe Housing Rule, and the paint-disturbing work performed after interim cleaning verification has been passed will be a minor repair and maintenance activity.

D. Who Should Pay?

If relocation of tenants is required as a result of an activity assisted by the Federal Government, the requirements of the Uniform Relocation Act (formally, the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601 et seq.) and its implementing regulations at 49 CFR Part 24, may be triggered (see ***www.hud.gov/offices/cpd/library/relocation/index.cfm***). Relocation is usually considered to be part of the cost of lead hazard control.

E. How Can Costs Be Minimized?

One approach to minimizing relocation costs is to reduce the time period of temporary relocation. It may be possible to streamline the work so it proceeds quickly, especially if contractors are offered financial incentives to do so. Also, in some circumstances, it may be possible to stage the work, as discussed above, so residents can return before nonhazardous renovation is finished.

Another approach is to minimize specific relocation costs by taking competitive bids or negotiating favorable rates for rental units for relocation, and costs of packing, moving, and storage. Prices should be based on actual expenses, however, not on a per-dwelling-unit rate.

Some local program administrators have found that the most cost-effective approach is to give residents a direct dollar payment to find another place to live temporarily. Beware, however, that if the work takes longer than expected and thus the residents' costs are higher than was planned, people may return to the unit before it is ready. This approach may work in conjunction with temporary relocation to a relative's or friend's home.

Still another approach is to try to move most of the residents only once, rather than both out and back in. This permanent relocation can work with multi-building projects in which residents of the first building are relocated, work is performed in that building, and then residents of the

next building are permanently relocated to the first building, and so on. Variations on this include residents moving from one floor to another, from one wing of a building to another, etc. Some residents may like this; some may not. For projects receiving federal assistance for the housing or the work, such permanent relocation may trigger requirements of the Uniform Relocation Act; see Section IV.D. Open communication with residents about the project and the owner's approach to lead safety may help in addressing concerns about relocation.

Finally, on-site dust testing may save time and money. Methods exist for reliably analyzing wipe samples on-site instead of in a fixed laboratory. These include portable X-ray fluorescence (XRF) analysis and anodic stripping voltammetry (ASV) (EPA, 2002b; Clark, 2002). These methods may provide testing results much more quickly than fixed-laboratory analysis by avoiding transportation of the samples to the laboratory and handling time within the laboratory. This approach may be particularly helpful for multi-family projects, in which a work crew may be working on a unit while the clearance test analysis is being performed on the crew's preceding unit. Thus they may reduce relocation difficulties and facilitate cooperation among all parties.

In States and Tribal areas where EPA is operating the lead risk assessment certification program, dust wipe samples for a clearance examination must be analyzed by a laboratory or testing firm recognized by EPA under the National Lead Laboratory Accreditation Program (NLLAP). In these States or Tribes, an NLLAP laboratory may perform on-site analyses of dust-wipe samples only if specifically accredited and NLLAP-recognized to do so. In States or Tribal lands where the State or Tribe is operating an EPA-authorized lead program, the same requirements generally apply, although there may be some differences (EPA, 2002a). While EPA clearance regulations and program procedures apply only to abatement activities and to renovations in which clearance is being conducted, HUD regulations and many State regulations apply the same procedures to non-abatement activities.

However, any person who is trained and otherwise qualified to operate the XRF instrument (such as licensed in accordance with State regulations on the use of devices with radioactive elements) or conduct the ASV (or other sampling and analytical) method may use one of these methods to conduct *preliminary* dust testing to determine whether a clearance area is clean and ready for the clearance examination, if allowed in the State or Tribal area. A person conducting a preliminary screen does not have to be a technician working for an NLLAP-recognized laboratory. Owners and contractors may wish to use such screening tests to minimize the likelihood of clearance failure. (See Chapter 15, Section VI.A.3, "On-Site Clearance.")

F. Communicating with Residents

Clear and documented communication with residents about the many details of relocation will facilitate a smoothly operating program. Administering organizations should establish policies, procedures, and assigned responsibilities to maximize efficiency of temporary relocation and assure that all program participants are treated in a consistent manner. Among the subjects that should be covered with residents are:

- The need for and importance of temporarily relocating to protect the health of residents and their children.
- The fact that residents must stay out of the work areas until permitted to return, and how that permission will be handled.
- Approximately how long the relocation will last, and how delays in allowing residents to return to their dwellings will be handled.

- The standards for the relocation unit, who is responsible for identifying it, and how that will be done.
- Detailed procedures for handling relocation, including such matters as packing, moving, storage, and caring for personal belongings, utilities, mail, security of the temporarily vacant unit, care for pets, and any special transportation needs (such as to and from school).
- What costs will be paid by the administering organization, limits on certain costs, and method of payment.
- The residents' responsibility not to damage the relocation unit.

It is recommended that policies and procedures on these matters be put in writing and that residents indicate their agreement by signing such documents. These policies and procedures should be made available to meet the needs of all residents including persons with limited English proficiency.

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

In asbestos abatement work and lead-based paint removal work on structural steel, it is common to create worksites 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 the exhaust. This process causes any air leakage to move *into* the containment area instead of *out* of the containment area. It also reduces dust fall and worker exposure by removing contaminants from the airstream through constant filtration.

Under OSHA's lead in construction standard, a "competent person" determines the appropriate ventilation controls, considering such factors as the safety of workers, occupancy of adjacent areas, whether exterior windows are available to provide dilution ventilation, or if negative air is more appropriate where scraping of surfaces treated with paint strippers may potentially release both volatile substances and lead simultaneously. The standard says that a competent person is a person capable of identifying existing and predictable lead hazards in the surroundings or working conditions, who has authorization to take prompt corrective measures to eliminate them, and who makes frequent and regular inspections of job sites, materials, and equipment as part of a program to ensure that workers are not exposed to excessive levels of airborne lead. (29 CFR 1926.62, paragraphs (b), (c), (e)(2), and (e)(2)(iii) . For further information about competent persons, see OSHA's Competent Person page, ***https://www.osha.gov/SLTC/competentperson/***.)

Due to the different aerodynamics of dust particles from leaded and asbestos fibers, negative pressure zones do not appear to be necessary for most forms of residential paint-disturbing work. Most lead-based paint abatement projects in the public housing program have not found it necessary to use negative air machines. 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 lead-based paint or lead-containing varnish 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. Up to 10 air changes per hour should be provided and all exhaust air must be passed through a HEPA filter.

If the floor to be sanded has been coated with varnish with low lead levels, negative air may not be necessary. One study has found that tight dust containment of the work area before the work, using engineering controls during sanding and careful cleanup afterwards can reduce worker exposure to dust and facilitate clearance of the worksite. The engineering controls used in this study included using HEPA vacuum exhaust attachments on sanding tools such as edgers and buffers and using drywall dust bags inside the canvas bags of drum floor sanding machines (Wisconsin, 2003).

The second case involves abrasive blasting, which is likely to produce extremely high levels of airborne leaded dust (NIOSH, 1992b) 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 were 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). This setup may also be necessary in cases of major demolition where wet work practices cannot be used to adequately dampen dust.

For nearly all types of paint-disturbing 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.

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Chapter 9: Worker Protection

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Chapter 9: Worker Protection

How To Do It

1. **Develop a written compliance plan and designate a competent person to oversee worker protection efforts (usually an industrial hygienist or a certified lead abatement supervisor).** To ensure worker exposure to airborne lead during residential lead-related work does not exceed the permissible exposure limit (PEL) set by the Occupational Safety and Health Administration (OSHA) (50 µg/m³ averaged over an 8-hour period), develop a written compliance plan and designate a competent person to oversee worker protection efforts (usually an industrial hygienist or a certified lead abatement supervisor). See the OSHA Lead in Construction Standard for complete details (29 CFR 1926.62) at ***http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10641***. OSHA's Lead homepage for the construction industry (***http://www.osha.gov/SLTC/lead/construction.html***) provides a range of regulatory and technical resources, such as the informational booklet "Lead in Construction" (OSHA Publication 3142-09R; ***http://www.osha.gov/Publications/osha3142.html*** and ***http://www.osha.gov/Publications/osha3142.pdf***.)

2. **Conduct an exposure assessment for each job classification in each work area. Monitoring current work is the best means of conducting exposure assessments.** Perform air sampling of work that is representative of the exposure for each employee in the workplace who is exposed to lead. Alternatively, if working conditions are similar to previous jobs by the same employer within 12 months, previously collected exposure data can be used to estimate worker exposures. Finally, objective data (as defined by OSHA) may be used to determine worker lead exposures in some cases. Exposures to airborne leaded dust greater than 30 µg/m³ (8-hour, time-weighted average) trigger protective requirements. Estimating exposure is not acceptable.

3. **Use specific worker protection measures.** If lead hazard control will include manual demolition, manual scraping, manual sanding, heat gun use, or use of power tools such as needle guns, then specific worker protection measures are required until an initial exposure assessment is completed. If the initial exposure assessment indicates exposures are less than 30 µg/m³, the requirements do not legally apply, although exposure to lead should be kept as low as possible at all times.

4. **Implement engineering, work practice, and administrative controls to bring worker exposure levels below the PEL.** Examples of such controls include the use of wet abatement methods, ventilation and the selection of other work methods that generate little dust.

5. **Supplement the use of engineering and work practice controls with appropriate respirators and implement a respiratory protection program where needed.** Provide a respirator to any employee who requests one, regardless of the degree of exposure.

6. **Arrange for a medical exam before work begins for each worker who will be required to wear a respirator. The exam will indicate whether the worker is physically capable of wearing a respirator safely. Conduct fit testing for all workers who will be required to wear respirators.** Workers with beards, scars, or unusual facial shapes may not be able to wear certain kinds of fitted respirators.

7. **Provide protective clothing and arrange for proper disposal or laundering of work clothing, and proper labeling of containers of contaminated clothing and equipment.**

8. **Provide hand washing facilities, with showers if exposures are over the PEL.**

9. **Implement a medical surveillance program that includes blood lead monitoring under the supervision of a qualified physician pursuant to OSHA regulations.** Initial blood testing for lead exposure is required by OSHA for workers performing certain tasks, such as manual scraping, whenever an exposure determination has not been completed, and for any worker who may be exposed to greater than 30 μg/m³ of lead on any day.

10. **Ensure that workers are properly trained in the hazards of lead exposure, the location of lead-containing materials, the use of job-specific exposure control methods (such as respirators), the use of hygiene facilities, and the signs and symptoms of lead poisoning.** OSHA requires all lead hazard control workers to be trained and to be given (communicated) specific information on lead hazards for the specific job they are doing. Employers are responsible for training their employees to comply with all of OSHA's construction standards, not just the Lead standard, and this training needs to be work site-specific.

11. **Post lead hazard warning signs around work areas. Also, post an emergency telephone number in case an on-the-job injury occurs.**

12. **Conduct work as specified.**

13. **Conduct worker decontamination before all breaks, before lunch, and at the end of the shift.** Decontamination of workers performing abatement usually consists of:

    - Cleaning all tools in the work area or a specially designated area in the restricted work area (end of the shift only).
    - HEPA vacuuming all protective clothing if visibly contaminated with paint chips or dust before entering the decontamination area.
    - Entering the decontamination area (dirty side).
    - Removing protective clothing by rolling outward (do not remove respirator yet); removing work shoes and putting in plastic bag. Remove all PPE slowly and from the inside-out to contain any accumulated dust.
    - Entering shower or washing facility.
    - Washing hands and then removing respirator.
    - Taking a shower, if available, using plenty of soap and water; washing hair, hands, fingernails, and face thoroughly (before lunch and at the end of the shift only).
    - Entering the clean area and putting on street clothing and shoes.

14. **Maintain exposure assessment and medical surveillance records for 30 years.** Notify workers of air sampling and blood lead level results within 5 working days after receiving the results. Provide each worker with a copy of the written medical opinion from their examining physician. Employers must maintain all records of exposure monitoring for 30 years, and all medical records for the duration of each worker's employment plus 30 years.

I. Introduction

The potential for worker exposure to lead (as well as to other hazardous substances, safety hazards, and physical agents) exists during all lead hazard control projects. Due to the recognized adverse health effects of lead, employers should minimize worker lead exposures as much as possible. Employers should refer directly to the OSHA construction lead standard for complete requirements. Links to several OSHA publications are found in Appendix 15.

Where To Get the OSHA Standard and Publications

OSHA standards can be obtained by:

Purchasing individual CFR titles from the U.S. Government Online Bookstore, ***http://bookstore.gpo.gov***.

Contacting the OSHA Publications Office at 800-321-OSHA (6742), option 5. Hearing- or speech-challenged individuals may access this number through TTY by calling the toll-free Federal Relay Service at 800-877-8339.

Visiting ***www.osha.gov*** (click on Regulations, then, lower down on the Regulations page, click on the Construction tab; for Lead in Construction, scroll to "***1926.62 - Lead***"; then click on the main body of the regulation and then each of the appendices).

II. Background on OSHA Requirements for Residential Lead Hazard Control Work

OSHA standards will apply to most forms of residential lead hazard control work. There are several OSHA standards that may apply.

HUD's 1990 Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing preceded OSHA's issuing the lead-in construction standard as an interim final rule in 1993. The Guideline's original chapter on worker protection was necessary for HUD abatement projects involving lead-based paint because, at that time, OSHA had no expanded lead standard for worker protection in construction. In fact, OSHA's interim final rule was promulgated in 1993 for the very purpose of filling this gap, and it was issued under the Congressional authority of Title X, Subtitle C, Sections 1031 and 1032, Worker Protection, of the Housing and Community Development Act of 1992 (58 Fed Reg. 26590-01, May 4, 1993).

Accordingly, when HUD last updated these *Guidelines*' chapter on worker protection in 1995, the OSHA standard for lead in construction (which covers interim controls, renovation, repair and painting (RRP), and related work in housing) was still relatively new, so a detailed but summarized presentation of this new OSHA standard was incorporated into Chapter 9 of the *Guidelines*. Since then, however, all of

OSHA's standards and guidance information have been made available to the public on the internet and through downloadable guidance publications and e-tools. OSHA information is also readily available from local OSHA Area Offices and State Consultation programs.

Therefore, to conserve resources and avoid duplication among federal agencies' overlapping requirements with regard to lead hazard control activities, and to ensure improved accuracy of regulatory requirements, Chapter 9 of these *Guidelines* has been substantially revised.

III. Signs

In 2012, OSHA issued a major change in its Hazard Communication Standard (HCS), 29 CFR 1910.1200, modifying the HCS to conform to the United Nations' Globally Harmonized System of Classification and Labelling of Chemicals (GHS). (77 *Federal Register* 17574-17896; March 26, 2012 (***http://www.gpo.gov/fdsys/pkg/FR-2012-03-26/html/2012-4826.htm***; see also ***http://www.osha.gov/dsg/hazcom/ghs-final-rule.html*** and OSHA's electronic newsletter at ***http://www.osha.gov/as/opa/quicktakes/qtGHS03212012.html***) As it is implemented through 2016, this rule will change requirements for material safety data sheets (MSDS) – to be renamed safety data sheets – and requirements for labels and signs.

Several of OSHA's substance-specific standards, including those for lead, have been revised regarding signs and labels. The lead standards contain new requirements, incorporated by the revised Hazard Communication Standard, for mandatory warning signs in each work area where an employee's exposure to lead is above the permissible exposure limit (PEL) of 50 $\mu g/m^3$ of airborne lead averaged over an 8-hour period.

The revised signage provisions of the lead standards – see 29 CFR 1910.1025(m)(2) in the general industry standard (which covers maintenance and other non-construction work in housing), and 29 CFR 1926.62(m)(1) in the construction standard – require that:

- On and after June 1, 2016, the signs for work areas must have the following wording:
  - For work covered by the lead in general industry standard:

DANGER
LEAD
MAY DAMAGE FERTILITY OR THE UNBORN CHILD
CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM
DO NOT EAT, DRINK OR SMOKE IN THIS AREA

  - For work covered by the lead in construction standard:

DANGER
LEAD WORK AREA
MAY DAMAGE FERTILITY OR THE UNBORN CHILD
CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM
DO NOT EAT, DRINK OR SMOKE IN THIS AREA.

- Before June 1, 2016, the signage for used for work covered by either the general industry or the construction industry may use either the wording above for that industry, or the wording below:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING.

Whichever signs are used in a work area, the employer must ensure that they are illuminated and cleaned as necessary so that the legend is readily visible, and that no statement appears on or near them that contradicts or detracts from the meaning of the required signs.

Consultation assistance is available on request to employers who want help establishing and maintaining a safe and healthful workplace. Funded largely by OSHA, the service is provided at no cost to small employers and is delivered by state authorities through professional societies and health consultants.

Paint with lead that is deteriorated or disturbed, even if its lead content is below the current EPA and HUD standards, may still pose a health hazard. As of the publication of the second edition of these *Guidelines*, in response to a petition received by the EPA on August 10, 2009, the EPA and HUD are considering whether to lower the dust hazard standards and/or modify the definition of lead-based paint.

Individual States that have approved plans for OSHA enforcement may adopt their own lead standards for the construction industry, as long as their requirements are at least as stringent as the Federal OSHA standard. Employers will need to ensure that their programs for worker protection meet applicable State requirements. The OSHA standard does not specify the methods for any given type of activity, such as lead-based paint removal. The method of removal is left to the discretion of the employer, and constitutes an important potential engineering control. In some cases, however, the method of abatement or interim control will have already been selected by a risk assessor and/or the property owner based on other considerations.

IV. Protective Clothing and Equipment

The EPA/HUD renovation, repair and painting (RRP) training curriculum recommends the following personal protective equipment for renovation, repair and painting: a painter's hat, disposable coveralls, and R-100, P-100 or disposable N-100 respirator. N-100 is a NIOSH rating for respirators that can be used around leaded dust. "100" means that the respirator has HEPA filtering capability. The "R," "P" and "N" filters refer to the environmental conditions that exist when the respirator is worn. The disposable N-100 respirator is acceptable for small jobs but under other work conditions, OSHA may require another type of respirator. Head covering, such as a painter's hat and shoe covers are recommended as always being appropriate for paint-disturbing work. Eye protection and gloves should be worn if needed, and an eye- and body-wash system must be in place if workers' eyes or body may be injured by caustic materials. In addition, OSHA requires that employers provide and enforce the use of protective clothing whenever employees are exposed to airborne lead above the PEL (irrespective of respirator use) and as interim protection for employees performing tasks listed in OSHA's task-related triggers. Hard-hats, goggles, safety shoes, and other personal protective equipment may also be required by other OSHA standards, depending on the type of work performed. These materials must be generally supplied at

no cost to employees. (See 20 CFR 1926.95(d). Non-specialty safety-toe protective footwear (including steel-toe shoes or steel-toe boots) and non-specialty prescription safety eyewear are among the items for which the employer generally does not have to pay.)

The lead standards contain new requirements, incorporated by the revised Hazard Communication Standard (see Section III, above), for labeling containers of contaminated protective clothing and equipment which is to be cleaned, laundered, or disposed of.

The revised signage provisions of the lead in general industry standard and the lead in construction standard require (see 29 CFR 1910.1025(g)(2)(vii)) and 29 CFR 1926.62(g)(2)(vii), respectively) that labels must have the following wording:

- On and after on June 1, 2015, the labels for containers of contaminated protective clothing and equipment to be cleaned, laundered, or disposed of must have the following wording:

  — For maintenance and other work covered by the lead in general industry standard:

  DANGER: CLOTHING AND EQUIPMENT CONTAMINATED WITH LEAD. MAY DAMAGE FERTILITY OR THE UNBORN CHILD. CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM DO NOT EAT, DRINK, OR SMOKE WHEN HANDLING DO NOT REMOVE DUST BY BLOWING OR SHAKING.

  — For RRP, interim control and other work covered by the lead in construction standard:

  DANGER: CLOTHING AND EQUIPMENT CONTAMINATED WITH LEAD. MAY DAMAGE FERTILITY OR THE UNBORN CHILD. CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM. DO NOT EAT, DRINK OR SMOKE WHEN HANDLING. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS.

- Before June 1, 2015, the label used for work covered by either the general industry or the construction industry may use either the wording above for that industry, or the wording below:

  CAUTION: CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS.

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Chapter 10: Housing Waste

How To Do It

- **State and local requirements**. Determine whether your State or local health or environmental department has any requirements for management and disposal of waste from work that may disturb surfaces covered with known or presumed lead-based paint; fulfill those requirements.
- **Waste categories**. Determine what categories of waste will be generated (low-lead waste content materials, architectural components, concentrated lead waste, or other waste) and follow the recommendations in this chapter.
- **Liquid wastewater**. Dispose of liquid wastewater in the toilet, not in a storm drain or on the ground.
- **Disposal acceptance of solid waste wrapping**. Determine if the planned state-approved disposal facility accepts solid waste wrapped in plastic or waste from residential projects (e.g., municipal or construction & demolition waste landfills).
- **Solid waste wrapping**. Wrap solid waste in heavy-duty plastic (6-mil polyethylene or equivalent); seal all seams.
- **Bag small waste material**. Place small waste material in heavy-duty plastic (single 6-mil or double 4-mil polyethylene or equivalent) bags and securely tape them shut.
- **Storing and transport of solid waste**. Store solid waste in a designated, secure area separate from the work area and transport it to a State-licensed or permitted solid-waste landfill.

I. Introduction

In August 2000, the U. S. Environmental Protection Agency (EPA) clarified its policy with respect to the status of waste generated by contractors as well as residents from lead-based paint-disturbing activities conducted in households (household waste) (EPA, 2000a). The clarification provided that the household waste exemption in the Resource Conservation and Recovery Act (RCRA; 42 U.S.C. §6901) applies to waste generated by contractors as well as to waste generated by residents. As a result, the household waste exemption applies to all residential paint-disturbing activities, including abatement, interim control, renovation and remodeling of housing. Types of housing included in the household waste exemption are single-family homes, apartment buildings, public housing, and military barracks. Residential lead-based paint waste is waste generated from these activities and includes, but is not limited to, known or presumed lead-based paint debris, chips, dust, and sludges. In 2003 EPA amended its solid waste regulations to codify this policy (EPA, 2003). A summary fact sheet (publication EPA530-F-03-007), available through EPA's website RCRA Online at ***www.epa.gov/epawaste/nonhaz/municipal/landfill/lbp_fs.pdf***, states that:

> Construction and demolition (C&D) landfills are allowed to accept residential lead-based paint (LBP) waste for disposal. So long as these landfills do not accept any other household waste, they do not have to change their current operating practices and procedures. Municipal solid waste landfills also may continue to dispose of residential LBP.
>
> This rule applies to residential LBP waste from abatement, rehabilitation, renovation, or remodeling in homes, residences, and other households. "Household" means single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas. Individuals and firms who create residential LBP waste, such as contractors and do-it-yourselfers, may dispose of LBP waste from these households at C&D landfills.

Household waste falls into four categories, for the purpose of this chapter:

- Materials that usually have low lead content, such as personal and mop wash water, protective clothing, and plastic sheeting;
- Architectural debris, such as painted doors, trim, and windows;
- Concentrated lead waste content materials, such as paint strippings, lead paint chips, and dust; and
- Other waste.

On the jobsite, waste should be separated into these categories to the extent possible (see Figure 10.1). While RCRA hazardous waste rules do not apply, HUD and EPA both recommend that the lead-safe practices described in this chapter be followed to reduce the likelihood that household waste will contaminate the environment.

States and local governments may institute hazardous waste handling and disposal requirements applicable to lead activities in housing. Owners and contractors should determine what, if any, State or local regulations apply, particularly what may be disposed of at municipal

FIGURE 10.1 Separate waste into categories during work.

solid waste or construction and demolition landfills. Owners and contractors must comply with these local requirements if they are more stringent than Federal rules.

II. Recommended Lead-Safe Practices

A. Low-Lead Content Waste Materials

This waste category typically exhibits Toxicity Characteristic Leaching Procedure (TCLP) concentrations of leachable lead below 5 ppm. The TCLP is a laboratory procedure designed to predict whether a particular waste is likely to leach chemicals into ground water at dangerous levels (see Unit II.C, below (***www.epa.gov/wastes/inforesources/pubs/orientat/romapc.pdf***). This waste category includes filtered personal wash water and mop water, disposable personal protective clothing that has been vacuumed before disposal, plastic sheeting that has been misted and cleaned before disposal, and carpeting. Wash water does not include unfiltered spent stripper solutions, stripper sludges, or any other liquid paint removal products, all of which are simply solid waste.

According to EPA, LBP debris is any component, fixture, or portion of a residence or other building coated wholly or partly with LBP. LBP debris can also be any solid material coated wholly or partly with LBP resulting from a demolition.

Paint chips and dust, leftover paint or paint thinners, sludges, solvents, vacuum filter materials, wash water, sandblasting material, contaminated and decontaminated protective clothing and equipment, and other wastes such as lead-contaminated soil are not considered LBP debris. They remain subject to RCRA requirements.

When properly decontaminated, some of these wastes, such as protective clothing and equipment do not exhibit toxicity characteristics for lead. Some of these wastes are generated in smaller amounts and are homogenous. A hazardous waste determination may easily be made through the use of the Toxicity Characteristic Leachate Procedure (TCLP) or knowledge of that waste. However, a firm is allowed to manage these materials as a solid waste, if:

- The quantities of hazardous waste (including non-LBP debris waste from LBP activities) the firm generates are less than 100 kg (i.e., approximately one 55-gallon drum/container) per month.
- The firm qualifies as a conditionally exempt small quantity generator (CESQG) of hazardous waste (including non-LBP debris waste from LBP activities).

Lead-contaminated soil is not considered LBP debris nor is it eligible to be disposed of under the exclusion rule. RCRA requirements must be followed when disposing of lead contaminated soil.

These *Guidelines* recommend that generators follow the following practices for low-level waste content materials:

- Large waste material should be wrapped in heavy-duty sheeting (6-mil polyethylene or equivalent), and all seams should be sealed with tape during storage and transported to a State-licensed or permitted solid waste disposal facility. (Some disposal facilities do not accept waste wrapped in plastic. In this case, the waste should be covered in plastic during storage and transport only.)
- Small waste material should be placed in heavy-duty bags (single 6-mil or double 4-mil polyethylene or equivalent). The bags should be securely taped shut with gooseneck closure. OSHA's

disposal requirement is that lead-contaminated protective clothing be placed in a closed container in the change area, per 29 CFR 1926.62(g)(2)(v).

- The waste should be stored in a designated secure (locked) area. Dumpsters should have lids and be padlocked.
- Liquid wastewater should be disposed of in the toilet after any local pretreatment steps (e.g., filtering, gravitational separation) have been satisfied. Wastewater should not be poured into storm drains or onto the ground.
- Wrapping and sealing large waste material in plastic may not be necessary if a covered transport vehicle is used and if plastic is used to line walkways to the vehicle during loading. Wrapping and sealing waste materials in plastic, however, will minimize final cleanup and dust generation from abrasion of loose components coated with lead-based paint.
- Solid waste should be disposed of only in State-licensed or permitted solid-waste landfills, either municipal or construction and demolition as permitted if available; otherwise it may have to be transported to an approved hazardous waste facility.

B. Architectural Components

This category includes waste defined as intact, discarded architectural components which are sometimes referred to as finish carpentry or painted building components. Such components include, but are not limited to, painted doors, door trim, windows, window trim or sills, baseboards, soffits, fascia, columns, railings, moldings, radiators, walls, and stone or brick (see Figure 10.2). Paint chips that are removed from or fall off these components are not included in this category. Category B does not include lead sheeting.

These *Guidelines* recommend the following procedures for handling architectural components:

FIGURE 10.2 Radiators and trim are examples of intact architectural components that are low-level lead waste.

1. Once components are removed from the contained work area, the cutting or breaking of painted materials or any action that is likely to generate leaded dust should be avoided.

2. Separate glass from windows for recycling. While it is still inside the work area, waste should be wrapped in heavy-duty sheeting (6-mil polyethylene or equivalent) and all seams should be taped shut. Confirm in advance whether the selected disposal facility will accept waste wrapped in plastic. If not, the waste should be covered with plastic during storage and transport only.

3. Store waste in a designated and secure area separate from the work area. If material is stored or handled outdoors, heavy-duty sheeting should be placed underneath and on top of the material to prevent soil contamination. Plywood or other durable material should be placed on top of the plastic to prevent puncture of the plastic by nails or other fasteners.

4. Waste should be transported in covered vehicles to minimize lead dispersal into the environment.

5. Waste should not be disposed of in a solid waste incinerator and it should not be reused or recycled for mulch. Solid waste should be disposed of only in State-licensed or permitted solid-waste landfills, either municipal or construction and demolition as permitted if available; otherwise it may have to be transported to an approved hazardous waste facility

Deconstruction: Deconstruction, an approach to increasing the amount of sustainable construction and decreasing the amount of waste generated from construction projects, has been described as,

> "The systematic disassembly of a building, generally in the reverse order of construction, in an economical and safe fashion, for the purposes of preserving materials for their reuse." (US Army, 2010)

and

> "'The disassembly of buildings so as to safely and efficiently maximize the reuse and recycling of their materials.' While cherry-picking the highest-value materials is standard demolition practice, deconstruction aims to increase reuse options by pushing materials salvage beyond the usual windows, doors and light fixtures to include flooring, siding, roofing and framing. In some cases, deconstruction can yield items that are no longer commercially available, such as the old-growth Douglas fir and redwood lumber." (EPA, 2000b)

Lead-based paint's "presence can affect the cost effectiveness of structural and non-structural deconstruction projects, because it limits the amount of lumber that can be reused or resold, increases worker safety expenses, and often results in higher costs for LBP removal procedures." (EPA, 2008) With strong regulations limiting the installation or other reuse of LBP-coated materials supporting the goal of minimizing the potential for subsequent lead exposure by building occupants, materials coated with LBP should not be reused directly. As EPA further notes, the feasibility of deconstructing a building containing materials coated with lead-based paint is very project specific. For example, LBP may be present on just a few building components, such that the small amount of LBP-coated materials would not meaningfully affect project costs, and the best option may be to dispose of the LBP wood. Where a large amount of LBP-coated materials is present, removing the lead-based paint may be feasible; obtaining a significant amount of valuable wood from a large-scale project may defray costs of paint removal. For example,

some species of dimensional lumber, such as oak, southern yellow or other pines, American chestnut, and Douglas fir, can be quite valuable, and may justify paint removal for deconstruction. Similarly, a wood's value is also determined by the original grade, the extent of damage from such things as nail holes and decay, and the size of the lumber. For instance, industry professionals prefer salvaged lumber that is at least 6-feet long with at least 2- by 4-inch dimensions (USDA, 2005). It must be stressed that if a project manager does decide to cut, grind, sand or otherwise manipulate LBP-coated materials, proper safety and health techniques, including containment of the dust, must be utilized to ensure the safety of project workers and subsequent building occupants; see Chapter 9 of these *Guidelines*.

FIGURE 10.3 Concentrated lead waste.

C. Concentrated Lead Waste

This category of waste includes paint strippings, lead paint chips and dust, and vacuum debris and filters. Such waste must be tested by an analytical laboratory and classified as either hazardous or non-hazardous. One EPA test method that is used is the Toxicity Characteristic Leaching Protocol (TCLP), which simulates leaching in a landfill in the laboratory by adding acid to the sample and mixing it for 24 hours before analyzing the liquid for heavy metals. Non-residential waste tested in accordance with the TCLP that it is likely to leach lead above 5 ppm is defined as toxic and must be labeled as hazardous waste category D008 (lead). Then appropriate transport and disposal is required (EPA, 2004) (see Figures 10.3 and 10.4).

These *Guidelines* recommend the following procedures for handling of residential waste:

- Wrap in plastic with seams sealed shut (if disposal facility allows) or place in heavy-duty bags (single 6-mil or double 4-mil polyethylene or equivalent).
- Cover during transport.
- Prohibit from being treated at a solid waste incinerator.
- Dispose only in a State-permitted or licensed solid waste landfill, if available; otherwise it must be transported to an approved hazardous waste facility.

FIGURE 10.4 Paint chips should be double-bagged and seams sealed.

D. Other Regulated Waste

In some cases, TCLP leachate lead levels of soil that is being removed from the site may exceed 5 parts per million, which EPA otherwise categorizes as hazardous waste (see Figure 10.5). RCRA regulates the proper disposal of toxic wastes, including residential soil that is significantly

FIGURE 10.5 **EPA regulates disposal of hazardous waste.**

contaminated with lead. An EPA summary of RCRA is at ***www.epa.gov/lawsregs/laws/rcra.html***; links to RCRA regulations in general are at ***www.epa.gov/epawaste/laws-regs/***. Links to information on waste regulation under RCRA is provided at the "Wastes - Information Resources" page, ***www.epa.gov/wastes/inforesources/***; a detailed introduction to RCRA is the "RCRA Orientation Manual 2008: Resource Conservation and Recovery Act," at ***http://www.epa.gov/wastes/inforesources/pubs/orientat/index.htm***. EPA can authorize a State to have the primary responsibility of implementing RCRA hazardous waste program or a more-stringent program. As of the publication of these *Guidelines,* all 50 states, the District of Columbia, and Guam are authorized to implement the base, or initial, RCRA program, and many also to implement subsequently promulgated parts of the RCRA program. To help the public find state programs, EPA has included both a map and an alphabetically linked list of states and US territories web sites at ***www.epa.gov/epawaste/laws-regs/state/stats/stats_safrn.htm***. EPA also has a site dedicated to reducing, reusing and recycling construction and demolition debris at ***http://www.epa.gov/osw/conserve/imr/cdm/index.htm***.

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Chapter 12: Abatement

Abatement – How To Do It

1. **Arrange for risk assessment or paint inspection**. Have a lead hazard risk assessment or lead-based paint inspection performed by a certified risk assessor or a certified inspector who is independent of the abatement contractor.

2. **Develop hazard control plan**. Develop a site-specific lead hazard control plan based on the hazards (risk assessment) or lead-based paint (inspection) identified and financing available. Prepare the work area (see Chapter 8); avoid high-dust jobs and procedures.

3. **Obtain waste permits**. Have the contractor obtain any necessary building or waste permits; notify local authorities if the local jurisdiction requires it.

4. **Select needed materials**. Together with the contractor (or designer or risk assessor), select specific building component replacement items, enclosure materials, paint removal equipment and/or chemicals, tools, and cleaning supplies. Consider waste management and historic preservation implications of the selected treatment.

5. **Develop specifications**. Develop specifications (usually for large projects only).

6. **Schedule other construction work**. Schedule other construction work so that leaded surfaces are not inadvertently disturbed and unprotected workers are not placed at risk. Include time for clearance examinations and laboratory dust sample analysis in the scheduling process (see Chapters 3 and 15).

7. **Select a contractor**. Select a certified abatement contractor using the lowest *qualified* bidder.

8. **Conduct preconstruction conference**. Conduct a preconstruction conference to ensure the contractor fully understands the work involved (for large projects only).

9. **Notify residents**. Notify residents of the dwelling and adjacent dwellings of the work and the date when it will begin. Implement relocation (if appropriate).

10. **Correct housing conditions that might impede work**. Correct any existing conditions that could impede the abatement work (e.g., trash removal, structural deficiencies).

11. **Post warning signs**. Post warning signs and restrict entry to authorized personnel only. Implement the worksite preparation procedures.

12. **Consider a pilot project**. For large projects only, consider conducting a pilot project to determine if the selected abatement method will actually work (pilot projects are sometimes completed before step 4).

13. **Consider collecting soil samples as an option**. As an optional quality control procedure, consider collecting pre-abatement soil samples, which may not have to be analyzed until post-abatement soil samples have been collected, analyzed, and compared to clearance standards. If post-abatement soil levels are below applicable limits, the pre-abatement samples need not be analyzed (see Chapter 15). Soil sampling is not required by EPA regulations as part of clearance. This is an optional activity (see Chapter 15).

14. **Execute construction work**. Execute abatement work. See the other sections of this chapter for step-by-step summaries for building component replacement, enclosure, paint removal, and soil abatement methods. See Chapter 13 for encapsulation methods. Observe local or State regulations if applicable.

15. **Store waste**. Store all waste in a secure area (see Chapter 10).

16. **Cleanup**. Conduct daily and final cleanup (see Chapter 14). Execute waste disposal procedures.

17. **Arrange for clearance**. Have an independent certified inspector technician or risk assessor conduct a clearance examination after waiting at least 1 hour after cleanup has been completed to let dust settle (see Chapter 15).

18. **Repeat cleaning if clearance fails**. If clearance is not achieved, repeat cleaning and/or complete abatement work. Repeat clearance examination and, if clearance is achieved, obtain any required formal release or, if required by the U.S. Department of Housing and Urban Development (HUD) or local authorities, owner's certification that the project has been completed required.

19. **Notify Residents.** Notify residents of affected dwellings of the nature and results of the abatement work.

20. **Pay contractors**. Pay contractor and clearance examiner.

21. **Conduct periodic monitoring**. Conduct periodic monitoring and reevaluation of enclosure or encapsulation systems (if applicable) or lead-based paint that was not abated as indicated in Chapter 6. Maintain records of all abatement, monitoring, reevaluation, and maintenance activities, and turn them over to any new owner upon sale of the property as part of lead disclosure. Provide proper disclosure and notification to tenants. See Appendix 6 for more information.

Building Component Replacement – How To Do It

1. **Prepare work area and plan new component installation**. Prepare the work area (see Chapter 8); avoid high-dust jobs and procedures. Plan how the new component will be installed. Whenever possible, use new, energy efficient window, door, and insulating systems.

2. **Prepare building component for removal**. Prepare the building component for removal. Turn off and disconnect any electrical circuits inside or near the building component to be removed.

3. **Mist component**. Lightly mist the component to be removed (unless electrical circuits are nearby).

4. **Score seams**. Score all painted seams with a sharp knife.

5. **Remove screws**. Remove any screws, nails, or fasteners.

6. **Pry component**. Use a flat pry instrument (crowbar) and hammer to pry the component from the substrate.

7. **Remove nails**. Remove or bend back all nails.

8. **Wrap component**. Wrap and seal bulk components in plastic and take them to a covered truck or secured waste storage area along pathways covered with plastic. Shovel any debris; see Chapter 10 for proper disposal methods.

9. **Vacuum dust**. Vacuum any dust or chips in the area where the component was located.

10. **Replace component** (optional).
11. **Cleanup**. Conduct cleaning (see Chapter 14).
12. **Conduct clearance**. Conduct clearance and reclean if necessary.

Enclosure Methods – How To Do It

1. **Post warnings on affected components**. Stamp, label, or stencil all lead-based painted surfaces that will be enclosed with a warning approximately every 2 feet both horizontally and vertically on all components. The warning should read: "Danger: Lead-Based Paint." Deteriorated paint should not be removed from the surface to be enclosed.
2. **Determine whether low- or high-dust job**. Prepare the worksite in accordance with guidance in Chapter 8; avoid high-dust jobs and procedures.
3. **Identify enclosure**. Attach a durable drawing to the utility room or closet showing where lead-based paint has been enclosed in the dwelling.
4. **Plan for monitoring**. Plan for annual monitoring of the enclosure by the owner.
5. **Repair substrates**. Repair unsound substrates and structural members that will support the enclosure, if necessary.
6. **Select enclosure material**. Select appropriate enclosure material (drywall or fiberboard, wood paneling, laminated products, rigid tile and brick veneers, vinyl, aluminum, or plywood).
7. **Prepare electrical fittings**. Install extension rings for all electrical switches and outlets that will penetrate the enclosure.
8. **Clean floors**. If enclosing floors, remove all dirt with a vacuum to avoid small lumps in the new flooring.
9. **Seal seams**. Seal and back-caulk all seams and joints. Back-caulk means applying caulk to the underside of the enclosure.
10. **Anchor enclosures**. When installing enclosures directly to a painted surface, use adhesive and then anchor with mechanical fasteners (nails or screws).
11. **Conduct cleanup**.
12. **Arrange for clearance**. Have a certified risk assessor or inspector technician conduct clearance testing and provide documentation.

Paint Removal Methods – How To Do It

1. **Use only approved removal methods**. Be sure all paint-removal methods are not prohibited methods. Avoid the following:

   a. Open flame burning or torching.

   b. Heat guns operating above 1100 °F.

   c. Machine sanding or grinding without a HEPA vacuum exhaust tool.

   d. Abrasive blasting or sandblasting without a HEPA vacuum exhaust tool.

   e. Paint stripping in a poorly ventilated space using volatile stripper.

   f. Dry scraping (except for limited areas).

2. **Determine whether low- or high-dust job**. Prepare the worksite in accordance with guidance in Chapter 8; avoid high-dust jobs and procedures.

3. **Ensure safe use of heat guns**. For heat gun work, provide fire extinguishers in the work area and ensure that adequate electrical power is available. Use for limited areas only. Train workers to avoid gouging or abrading the substrate.

4. **When using mechanical tools, USE only HEPA-equipped tools**. Be sure workers keep the shroud against the surface being treated. Vacuum blasting and needle guns should not be used on wood, plaster, drywall, or other soft substrates. Observe the manufacturer's directions for the amount of vacuum airflow required.

5. **Wet scrape**. For wet scraping, use a spray bottle or wet sponge to keep the surface wet while scraping. Apply enough water to moisten the surface completely, but not so much that large amounts run onto the floor or ground. Do not moisten areas near electrical circuits.

6. **Use off-site chemical stripping facilities, if feasible**. For chemical paint removers, determine if the building component can be removed and stripped off-site. Off-site stripping is generally preferred to on-site paint removal. Observe all manufacturers' directions for use of paint removers.

7. **Remove components carefully**. For off-site stripping, determine how to remove the component. Score the edges with a knife or razor blade to minimize damage to adjacent surfaces. Punch or tag the building component if similar building components are also being stripped off-site (e.g., doors). This will ensure that the individual component is reinstalled in the original location. Inform the off-site paint remover that lead-based paint is present before shipping. Wrap the component in plastic and send to the off-site stripping location. Clean all surfaces before reinstallation to remove any lead residues by vacuuming all surfaces, cleaning with other lead specific or all-purpose cleaners detergents, and vacuuming again. Conduct cleanup and clearance.

8. **Test effectiveness of on-site stripper, if used**. For on-site paint removal, first test the product on a small area to determine its effectiveness. Chemical paint removers may not be effective or desirable on exterior, deteriorated wood surfaces, aluminum, and glass. Provide neoprene, nitrile, rubber, or polyvinyl chloride (PVC) gloves (or other type of glove recommended by the manufacturer); face shields; respirators with combination filter cartridges for leaded-dust and organic vapors (if appropriate); and

chemical-resistant clothing. Be sure to select the right type of organic vapor filter cartridge, gloves, and clothing for the specific chemical being used. Portable eyewash stations capable of providing a 15-minute flow must be on-site. Apply the chemical and wait the required period of time. Maintain security overnight to prevent passersby from coming into contact with the chemical. For caustic chemical paint removers, neutralize the surface before repainting using glacial acetic acid (not vinegar). Repaint and conduct cleanup and clearance.

9. **Dispose of waste properly** (see Chapter 10).

10. **Conduct cleanup**.

11. **Arrange for clearance**. Have a certified risk assessor or lead-based paint inspector conduct a clearance examination and provide documentation (see Chapter 15).

Soil and Exterior Dust Abatement – How To Do It

1. **Identify any soil hazard**. Determine if a soil-lead hazard exists. For a hazard to exist, a total of at least 9 square feet of soil in a single yard or area must be bare and soil concentrations must be equal to or exceed either 1,200 µg/g of lead for the yard or building perimeter or 400 µg/g of lead for small, high-contact play areas. Bare soil above these levels should be treated by either interim controls or abatement. Soil abatement is most appropriate when levels of lead are extraordinarily high (equal to or greater than 5,000 µg/g) and when use patterns indicate contact frequency and exposure will be high.

2. **Optionally, collect pre-abatement soil samples**. As an option, collect pre-abatement soil samples to determine baseline levels. These samples need not be analyzed if post-abatement soil samples are below applicable clearance levels.

3. **Determine soil abatement method**. Determine the method of soil abatement (soil removal and replacement, soil cleaning, or paving). Soil cultivation (rototilling or turning over the soil) is not recommended.

4. **Prepare carefully for paving**. If paving, use a high-quality concrete or asphalt. Observe normal precautions associated with traffic load weight and thermal expansion and contraction. Obtain any necessary permits. Keep soil cultivation to a minimum.

5. **Plan soil removal carefully**. If removing and replacing soil:

   - ✦ Determine if waste soil will be placed in an on-site or off-site burial pit. Prepare vehicle operation and soil movement plan. Test new replacement soil (should not contain more than 400 µg/g lead).
   - ✦ Contact the local information source to determine location of underground utilities, including water, gas, electric, cable TV, and sewer, or contact each utility individually. Mark all locations to be avoided.
   - ✦ Remove fencing if necessary to allow equipment access and define site limits with temporary fencing, signs, or yellow caution tape.
   - ✦ Tie and protect existing trees, shrubs, and bushes.
   - ✦ Have enough tools to avoid handling clean soil with contaminated tools.

- Remove soil.
- Clean all walkways, driveways, and street areas near abatement area.
- Replace soil at proper grade to allow drainage.
- Replacement soil should be at least 2 inches above existing grade to allow for settling.
- Install new soil covering (grass or sod) and maintain it through the growing season.
- Have enough workers and equipment available to complete the job in 1 day.

6. **Manage disposal of soil waste carefully** (see Chapter 10).
7. **Conduct final cleanup and visual inspection for clearance** (see Chapter 15).
8. **Provide walk-off mat(s) for residents**. Provide walk-off doormats to residents and educate them on the benefits of removing shoes at the dwelling entryway.

I. Principles of Lead-Based Paint Hazard Abatement

A. Longevity of Abatement

There are several approaches to abatement. Abatement is either: the removal of the building component, the removal of the paint itself, or the long-lasting – at least 20 years – enclosure or encapsulation of lead-based paint hazards. (For enclosure, see Section III of this chapter, and for encapsulation, see Chapter 13.) From a public health perspective, properly conducted abatement is the preferred permanent or long-lasting response to lead hazards. Abatement has two principal advantages: it provides a long-term solution, and little (if any) monitoring or reevaluation of the treated surface is necessary because failure is less likely to occur. Abatement treatments provide longer-lasting safe conditions than interim controls because the effectiveness of the work is less dependent on resident action, maintenance of housing stock, the conscientiousness of property managers, and the attention of maintenance workers during repair.

As used in this chapter, abatement can mean either correction of lead-based paint *hazards* (as defined in Title X) or removal, "permanent" encapsulation or "permanent" enclosure of all lead-based paint, as describe below. The methods explained in this chapter apply to abatement of both lead-based paint hazards *and* lead-based paint. From the Federal perspective, construction activities intending only to remodel, renovate or paint, are not considered abatement. Abatement does include work intending to permanently eliminate lead-based paint or lead-based paint hazards.

Interim controls, abatement, or a combination of the two are acceptable methods of addressing lead-based paint hazards. In contrast to interim controls, lead-based paint abatement refers to a group of measures that can be expected to eliminate or reduce exposures to lead hazards for at least 20 years under normal conditions. As 20 years is the expected lifespan of many commonly used building components, abatement is the closest one can get to a "permanent" solution in housing. The abatement methods described in this chapter should be capable of lasting 20 years under typical conditions. Any methods developed in the future that also last 20 years will be acceptable as abatement methods. This orientation toward performance standards should provide owners and the abatement industry with opportunities for innovation and flexibility, ensuring that the abatement method selected is the one that is most cost effective for a particular component.

The term "abatement" also includes a number of other activities that are not directly related to the work itself, but that must be included in the overall effort for the abatement to be successful. These activities include lead hazard evaluation, planning, cleaning, clearance, and waste disposal and are covered elsewhere in these *Guideline*s. The reader must study and understand the material in these other chapters prior to undertaking an abatement project. This chapter alone does not provide all the information necessary to complete a successful abatement job. When abatement is performed inadequately, or without sufficient protection, lead exposures to children increase (Amitai, 1987; Chisholm, 1985; Farfel, 1990; Rabinowitz, 1985a). When performed properly, abatement is known to be effective (Amitai, 1991; Staes, 1994; HUD, 1991; Jacobs, 1993a; Farfel, 1994a; Staes and Rinehart, 1995).

Abatement refers to any measure designed to permanently eliminate lead-based paint or lead-based paint hazards in accordance with standards established by the U.S. Environmental Protection Agency (EPA) pursuant to Title IV of the Toxic Substances Control Act (TSCA). Abatement strategies include removal of lead-based paint; enclosure of lead-based paint; encapsulation of lead-based paint (according to the standards and procedures set forth in Chapter 13); replacement of building

components coated by lead-based paint; removal of lead-contaminated dust; removal or covering of lead-contaminated soil with a durable covering (not grass, gravel, or sod, which are considered interim control measures); and preparation, cleanup, disposal, post-abatement clearance testing, recordkeeping, and monitoring (if applicable).

More than any other abatement method, on-site paint removal involves the greatest degree of disturbance and dust generation. Therefore, on-site removal of lead-based paint from a substrate should be carried out only if abatement rather than interim control is required and no other abatement method is feasible. For example, removal of paint from metal doorframes may be the only feasible abatement option, especially if the frames cannot be removed or enclosed and the paint cannot be stabilized. Paint removal may increase the level of lead in household dust and make effective cleaning more difficult. Even if dust clearance standards are met, any increase in leaded-dust levels over baseline levels means some increase in exposure. Furthermore, all paint removal methods leave behind some residues embedded in the substrate, which could continue to pose a hazard if the surface from which the paint is removed is later disturbed. Therefore, paint removal is the most invasive of abatement methods and should be avoided if possible.

Abatement also offers the greatest challenge to planning, since it is often performed in the context of other building construction work, while interim controls are more likely to be performed alone or as part of other maintenance work.

In fact, many forms of abatement require special construction skills in addition to protective measures and dust control techniques. For example, one of the most common forms of lead-based paint abatement is window replacement. Abatement contractors need to possess adequate carpentry skills to install (for example) new windows, as well as the demolition, dust containment, and cleaning skills held by abatement contractors. While providing some guidance, this chapter is not intended to impart carpentry, painting, resurfacing, and other construction knowledge required for most types of abatement. Abatement contractors should either subcontract this type of construction work or acquire the necessary construction skills before the job begins. Of course, all construction work must be performed in accordance with local code requirements and all abatement work must be done by certified firms and individuals.

Many forms of abatement can be integrated into construction work, which provides an opportunity to install systems that will have long-term impact. For example, whenever building components, such as doors and windows, are replaced, the *Guidelines* recommend that they be replaced with products that are more energy efficient. This will help reduce energy consumption and increase cost efficiency.

EPA has established standard training curricula and regulations for the training and certification of all individuals engaged in lead-based paint risk assessment, inspection, and abatement, and minimum performance standards for the purpose of certifying individuals who supervise lead abatement projects and conduct clearance examinations. EPA's regulations are generally implemented through State, Tribal, or territorial programs. All abatement contractors and firms must be certified to perform this type of work, and all abatement workers and supervisors must be trained and certified. Certification of abatement contractors and completion of clearance examinations by independent, certified risk assessors, lead-based paint inspectors or sampling technicians, ensures that abatement work is conducted properly and safely.

For exterior work, as an optional quality control procedure, consider collecting pre-abatement soil samples, which may not be analyzed until post-abatement soil samples have been collected, analyzed and compared to clearance standards. If post-abatement soil levels are below applicable

limits, the pre-abatement samples need not be analyzed. Soil sampling is not required by EPA regulations as part of clearance. This is an optional activity (see Chapter 15).

B. Prohibited Abatement Methods

HUD and EPA prohibit certain techniques (see 24 CFR 35.140, and 40 CFR 745.227(e)(6), respectively) because they are known to produce extremely high levels of lead exposure and make dwellings difficult to clean up. In addition, for abatement in federally-owned and assisted residences, HUD prohibits an additional technique if toxic volatile chemical stripping compounds are used, in order to prevent hazardous levels of the chemicals in the air of the residence being abated. See Table 12.1. State and local regulations may also prohibit some or all of these techniques or other techniques.

These *Guidelines* recommend strongly against the use of uncontained hydroblasting. Removal of paint using this method can spread paint chips, dust, and debris beyond the work area. Pressure washing is also discouraged. Contained pressure washing at less than 5,000 pounds per square inch (PSI) can be done within a protective enclosure to prevent the spread of paint chips, dust, and debris. Water runoff should also be contained (see Chapter 8).

Table 12.1 Prohibited Lead-Based Paint Abatement Methods.

1. Open flame burning or torching (includes propane-fueled heat grids).
2. Machine sanding or grinding without HEPA local vacuum exhaust tool.
3. Abrasive blasting or sandblasting without HEPA local vacuum exhaust tool.
4. Heat guns operating above 1100° F or charring the paint.
5. Dry scraping (except for limited surface areas).
6. Paint stripping in a poorly ventilated space using volatile stripper.

C. Vacuum Cleaning

In this chapter, vacuum cleaning is recommended a number of times. These *Guidelines* recommend that a HEPA-filtered (high-efficiency particulate air) vacuum should be used if possible, but that a high-quality household or commercial vacuum should be used if a HEPA vacuum is not available. (Note that, for RRP work, EPA's RRP Rule requires that any vacuum cleaners used be HEPA-filtered; see Chapter 11.) See Section III.A of Chapter 14 for a discussion of factors in choosing an effective vacuum cleaner and Section V of Chapter 11 for cleaning of carpets.

D. Periodic Monitoring and Reevaluation

Among the advantages of abatement compared to interim controls is that ongoing monitoring by the owner is either unnecessary (in the case of complete lead-based paint removal) or relatively

simple (in the case of enclosure or encapsulation). Failures of enclosures and encapsulations are relatively easy to observe visually. (Failures should be repaired immediately. See Chapter 6.) Also, whereas professional independent reevaluation may be required at 2-year intervals for some federally assisted multi-family properties that have been treated with interim controls or standard treatments, such reevaluation is not necessary for properties that have had all lead-based paint abated. This is true even if lead-based paint has been enclosed or encapsulated, *provided* ongoing visual monitoring and lead-safe maintenance are performed by the owner in assisted units as recommended in Chapter 6. (Also see Chapter 5 on reevaluation.)

Abatement can be undertaken after lead-based paint inspections or risk assessments determine the presence of lead-based paint or other lead hazards (see Chapters 3, 5 and 7 for a description of the differences between risk assessments and inspections). If this initial evaluation phase is not completed, then all painted surfaces must be presumed to contain lead-based paint. This presumption may be cost-effective if it is likely that all surfaces that might be treated contain lead-based paint or if the housing unit is to be rehabilitated and all surfaces and components will be either covered or replaced.

The cost of a carefully conducted lead-based paint inspections or risk assessments, however, is usually recovered by a more focused abatement effort, especially when component replacement or enclosure is considered. The cost savings of a more targeted abatement effort based on complete testing are noteworthy in the case of abatement as opposed to interim controls, because the costs of abatement are initially much higher than interim controls.

Recordkeeping

Recordkeeping is essential for all abatement methods. The location of enclosed or encapsulated lead-based paint must be made known to future residents and owners, who may undertake remodeling or repair efforts that could disturb the remaining lead-based paint and thereby create a lead-based paint hazard. Depending on the jurisdiction, the location of enclosed or encapsulated lead-based paint may need to be filed with the appropriate municipal agency for future reference when the agency needs to issue construction permits for renovation. Provide proper disclosure and notification to current tenants as well (see Appendix 6).

E. Types of Abatement

This chapter covers four types of abatement:

- Building component replacement.
- Enclosure systems (this section does not include encapsulation, which is addressed in Chapter 13).
- On-site and off-site paint removal.
- Soil removal or covering.

The available information on paint abatement methods is summarized in Table 12.2. The reader should not conclude that a particular method is not permitted simply because it is not discussed here. With the exception of the prohibited techniques listed above, new techniques should be developed, studied, and reported to HUD, the Centers for Disease Control and Prevention (CDC), EPA, and other

Government agencies for distribution to the public.

F. Encapsulation

Encapsulants are coatings or rigid materials that rely on adhesion to a lead-based painted surface and are not mechanically fastened to the substrate. Encapsulants are considered separately in Chapter 13. *Enclosures* (not to be confused with encapsulants) are defined as durable, rigid construction materials that are mechanically fastened to the substrate with screws, nails, or other mechanical fastening system that can be expected to last at least 20 years under normal conditions. (See Section III of this chapter on enclosures.) These *Guidelines* do not consider encapsulation to be the same as enclosure. Depending on the particular circumstances and product, encapsulation can be either a form of paint stabilization (an interim control) or abatement (see Chapter 13).

G. Relationship to Renovation, Repainting, Remodeling, Rehabilitation, Weatherization, and Other Construction Work

Many forms of abatement involve the same physical work as other types of construction often performed in housing. In many cases, only the intent of the work differs. Lead-based paint abatement is intended to produce conditions that prevent lead poisoning. Other construction work is intended, among other things, to improve aesthetic living conditions, bring the dwelling up to code, preserve historical evidence, and promote energy efficiency. For example, depending on its intent, window replacement could be considered to be a lead-abatement method, renovation work, or energy conservation/weatherization work.

HUD's Lead Safe Housing Rule requirements vary depending on the type and amount of federal housing assistance (see Appendix 6) (HUD, 1999). The Rule applies to certain private owners and specific federally-funded housing activities. Individuals at the State or local level who are responsible for making determinations about weatherization or rehabilitation projects must have a clear understanding of the federal requirements applicable to specific funding sources. DOE-funded weatherization work is considered to be "renovation" under EPA's RRP rule (See Chapter 4; see also DOE, 2002).

It is well known that lead-based paint-disturbing activities have the potential to create dust-lead hazards. Therefore, regardless of funding source, HUD strongly recommends that all activities disturbing known or presumed lead-based paint use trained workers, lead-safe work practices and undergo a clearance examination.

While the intentions of each of these activities differ, experience shows that many of them can be combined in order to yield savings. In the public housing program, for example, most of the abatement occurs in the context of housing modernization or rehabilitation work. This approach has proven to be feasible and cost effective.

Congress recognized the wisdom of combining lead abatement with rehabilitation work. Under Title X, any residential construction job receiving more than $25,000 per dwelling unit in Federal rehabilitation funds is ***required*** to have all lead-based paint hazards on the property abated. If $5,000 to $25,000 per dwelling unit in Federal rehabilitation funding is received, either interim controls or abatement must be implemented (HUD, 2009).

Finally, lead abatement procedures cannot guarantee that children will not be exposed to lead in the future. Enclosure systems or encapsulants could fail, exposing the hazard again. Soil coverings could also fail, or other sources of lead could recontaminate the soil, resulting in exposures. Surfaces that were made cleanable may deteriorate or may not be kept clean, allowing leaded dust to re-accumulate to

hazardous levels. Nevertheless, abatement constitutes the most extensive and protective intervention currently available. If practiced properly, abatement will greatly reduce the risk of lead poisoning.

II. Building Component Replacement

Building component replacement is defined as the removal of doors, windows, trim, and other building items that contain lead-based paint hazards and their replacement with new lead-free components. Component replacement is the most desirable abatement method because it offers a permanent solution to the lead-based paint problem for the particular component(s); but it may not be feasible for all of the LBP present. If done properly, it also minimizes contamination of the property and exposure of the workers. In addition, building component replacement can be integrated into general building rehabilitation activities. Components, such as doors and windows, should be replaced with more energy efficient models, which will help to reduce energy consumption and increase cost efficiency. In some cases, component replacement may cost less than abatement, especially when ongoing maintenance and energy costs are considered. Component replacement may be more expensive, however, especially for historic preservation projects, as new building components that match the originals may have to be custom made. For some historic preservation projects, replacement may not be permitted (see Chapter 18).

The skills required to perform building component replacement properly are similar to those of the skilled carpenter. For example, it is important to know how the various building components were joined so that they can be taken apart with minimal contamination and damage to adjoining surfaces.

The owner may choose to simply remove certain types of components without replacement. This is acceptable as long as applicable codes are observed. HUD does not recommend reinstalling salvaged building components containing lead-based paint in other properties unless the lead-based paint is removed.

A. Worksite Preparation

The appropriate worksite preparation level should be selected based on the size of the building component, its state of deterioration, and the ease of removal. The more deteriorated the component and the larger the surface area to be disturbed, the higher the worksite preparation level should be. Certified risk assessors or certified abatement supervisors or trained project designers may determine the appropriate worksite preparation for a project (see Chapter 8).

1. Security

Security of the premises is an important issue. If windows and doors are removed but not replaced on the same day, it may be necessary to install temporary barriers over window and door openings to prevent vandalism and theft over night. Therefore, every effort should be made to remove and replace doors and windows on the same day.

Table 12.2 Comparison of Lead-Based Paint Abatement, Component Removal and Enclosure

	Abatement and Removal						Enclosure			
Attributes	HEPA Needle Gun	Heat Gun	HEPA Sanding	Remove/ Replace	Caustic Paste/ Solvent	Off-site Stripping	Plywood Paneling	Gypsum	Prefab Metal	Wood, Metal, Vinyl Siding
Skill Level	High	Moderate	Moderate	High	Moderate	Moderate	Moderate	Moderate	High	Moderate
Aesthetics (1)	Erodes surface	Gouges	Gouges/ roughens	Good	Gouges	Good	Good	Good	Good	Good
Applicability	Very low, limited to metal and masonry	Wide, can damage some components	Low, limited by surface contour	Wide, dependent on skill	Wide, can damage some components	Low, components only	Wide, walls	Wide, walls and ceilings	Varied, limited by components	Wide, walls
Lead Presence	Largely removed	Largely removed	Largely removed	Removed	Largely removed	Largely removed	Remains	Remains	Remains	Remains
Generation of Hazardous Waste (2)	Low to moderate	Low to moderate	Low to moderate	Low	High	High, but maintained off-site	Low	Low	Low	Low
Weather Limitations	Moderate	High	Moderate	Minimal	High	None	Minimal	Minimal	Minimal	Minimal
Applicable to Friction Surface	Some	Yes	Some	Yes	Yes	Yes	No	No	Yes	No
Surface Speed of Methodology	Slow	Slow	Slow	Moderate	Slow	Can be slow, requires coordination	Moderate	Moderate	Moderate	Moderate
Training Required	High	Moderate	Moderate	High	Moderate	Moderate	High	High	High	High
Capital Required	High	Low	Moderate	Moderate	Low	Low	Low	Low	High	Moderate
Worker Protection Required (3)	High	High	High	Moderate	High	Moderate	Low	Moderate	Low	Low
Finish Work Required	Tentatively	Moderate	Moderate	Low	Moderate	Moderate	Wide	Wide	Limited	Wide
Product Availability	Limited	Moderate	Limited	Wide	Moderate	Limited	Moderate	Moderate	Wide	Wide
Durability	Long	Long	Long	Long	Long	Long	Moderate	Moderate	Moderate	Moderate
Labor Intensity	High	High	High	High	High	Moderate	High	High	High	High
Overall Safety (3)	Moderate	Moderate	Moderate	Very high	Moderate	High	High	High	High	High
Surface Preparation	None	None	None	None	Minimal- adjacent areas	Minimal-hardware removal	Minimal	Minimal	Minimal	Minimal
Cost	High	High	High	High	High	High	Moderate	Moderate	High	Moderate

Notes: (1) – The degree of damage to the surface will depend on the expertise of the operator.

(2) – Concentrated lead-based paint waste or sludges from paint removal using caustic or organic solvent removers have to be TCLP tested to determine if they are hazardous waste. See Chapter 10.

(3) – Any construction work involves increased safety risks.

2. Planning for Waste Storage

While most lead hazard control work in housing is exempt from hazardous waste regulation, discarded architectural components must still be properly managed (see Chapter 10). All building components coated with lead-based paint should be stored in a secure, locked area, as should all lead-contaminated waste until it is disposed of. They should not be sold or released to anyone who might reinstall them in another dwelling unless all of the lead-based paint is removed first. Therefore, it is important to identify where waste will be stored and how it will be secured during the project. (See Section II.D, Transportation and Storage of Waste, below.)

B. General Procedures for Building Component Replacement

- Using a garden sprayer or atomizer, lightly mist the component to be removed with water to help keep the dust down during the removal process. Before applying the water, be sure there are no electrical circuits inside the component. (If electrical circuits are present inside the component, they must be turned off and disconnected before removal. No water mist should be applied even if electrical circuits are turned off or de-energized.)

- Using a utility knife or other sharp instrument, carefully score all affected painted seams. This will provide space for a pry instrument and will minimize paint chipping and dust generation during removal.

- Remove any screws or other fasteners. Using a flat pry instrument and a hammer, carefully pry the affected building component away from the surface to which it is attached. The pry bar should be inserted into the seam at the nail (or other fastening device) at one end of the component and pressure applied. This process should be repeated at other fastening locations until the end of the component is reached. The component will be removed intact and chip and dust generation will be minimized when prying is done this way. A pry point pad or softener may be required to minimize damage to adjoining substrates. Wider replacement trim can sometimes be used to cover adjacent area damage.

- As there is often a considerable amount of leaded-dust underneath or behind the component being removed, begin cleanup immediately after the individual component has been removed.

- Carefully remove or bend back all nails (or other fastening devices) and wrap the component in durable, puncture-resistant plastic sheeting and seal with duct tape. Wrapping components in plastic may not be necessary if the dwelling is vacant and if the truck and the pathway to the truck are lined with plastic. Use a vacuum to remove any dust that may have accumulated behind the components as soon as they have been removed. Vacuuming may be performed by another person while the removal is underway. Preparing the area for the new component (e.g., squaring, reducing, or enlarging openings) may also release accumulated dust that should be removed. Dispose of wrapped components properly.

- Bring new lead-free components into the work area only after all dust-generating activity is complete and the dust has been cleaned up by at least one vacuuming.

C. Removal and Replacement Procedures for Specific Components

1. Baseboards, Casings, and Other Trim

The term "other trim" applies to such components as window casings, interior sills (stools), aprons, door casings, baseboards (including caps and shoe moldings), chair rails, exterior fascia, soffits, shutters, and crown moldings (see Figure 12.1). Components with lead-based paint should be removed as described in the previous section.

FIGURE 12.1 Removing and Replacing Trim: interior (left), exterior (right).

New lead-free components should be installed in a professional manner using standard carpentry practices. In situations where trim is being applied to lead-based painted walls, ceilings and floors that were enclosed, or casings for windows or doors where the jambs have been enclosed, the trim should be back-caulked before installation as an added precaution. Back-caulking refers to the application of caulk to the perimeter of the backside of rigid building materials to seal them before installation, preventing leaded-dust from entering the living space through cracks and crevices. Use a high quality caulk that is warranted for at least 20 years.

2. Windows

The term "window" applies to the sash, the stop and parting beads, window jambs, door frame and trim. Affected components should be removed as described in Section B. Window replacement can involve the removal of a wooden or metal unit and the installation of a wood, vinyl, or metal unit in its place (see Figure 12.2 and 12.3). If the jamb is not removed, it can often be enclosed by the new window frame system, which should be caulked and fastened. The remaining exterior portion of the jamb, if any, can be wrapped with coil stock (aluminum or vinyl or equivalent) after back-caulking. In situations where window units must be replaced in kind (e.g., historic preservation), the jambs should be removed and replaced also to make sure that no friction surfaces coated with lead-based paint remain. Generally, friction surfaces should not be painted.

FIGURE 12.2 Protecting the interior of a unit for exterior window abatement.

FIGURE 12.3 Replacement window system.

Depending on the building construction, it may be possible to remove the entire window system. The new lead-free components should be installed in a professional manner using standard carpentry practices. Windows may be replaced from the interior or exterior of the property. If windows are replaced from the exterior and only exterior clearance is planned, the interior of the unit must be protected by polyethylene sheeting.

3. Interior and Exterior Doors

Interior and exterior doors include the doorstops, door jambs and door frame (see Figure 12.4). Affected components should be removed as described above. Typical door replacement usually involves the removal of a wooden unit and the installation of a pre-hung wooden unit in its place. In this type of door replacement, the jamb is rarely removed, but is usually saved and enclosed with the new doorjamb after back-caulking. Wooden jamb extensions or coil stock, properly back-caulked, can be used to enclose any remaining portion of the jamb. In situations where pre-hung door units are not permissible (e.g., code requirements, historic preservation regulations), the original jamb should also be removed and replaced, if possible, to make sure that no friction surfaces coated with lead-based paint remain. If the jamb cannot be replaced, the stop should be removed and replaced with new material after the old jamb is carefully stripped.

Primers on Metal Components

In regard to whether lead-containing primers applied at the factory to metal doors, door frames, railings and other metal building components could create a hazard to people, if it can be determined that the lead on metal doors and frames resides only in the primers, and that the primers were factory applied and are in sound condition, then the primers themselves need not be abated or removed. , This is an exception to the general lead hazard control requirement, However, finish coats of paint that cumulatively contain lead of 1 milligram per square centimeter or greater, or the alternative standard of 0.5 percent by weight or greater, are treated as lead-based paint. If laboratory analyses of samples of the field-applied finishes are negative (no lead-based paint), the metal doors and frames do not require abatement but should be monitored to ensure that

FIGURE 12.4 Pre-and post-abatement interior doors.

the lead-bearing primer does not become defective. If the base metal is exposed while sampling the field-applied finish paint, then the existence of a permanent bond cannot be assumed and the entire sample should be analyzed for presence of lead. Any damage to the primer resulting from sample collection should be repaired immediately in a manner that restores the integrity of the primer coat.

For the metal doors and frames under this exception, primers should be intact and doors should be operating properly, free from impact or abrasion between moving parts that will damage any surfaces. If this exception for factory-applied primers is used, risk assessors should advise property owners or building managers of the importance of continued monitoring of the paint surfaces to ensure that subsequent surface deterioration or other factors do not result in exposing defective lead-based paint surfaces (the primers). Under this exception, property owners or building managers must commit to a plan for ongoing monitoring of the condition of the painted surfaces. The subsequent appearance of rust indicates a failure of the paint and primer, and the component must be abated.

Although unlikely, adhesion of the primer could be a problem. A simple "x" cut or crosshatch test will show if this is a problem. If adhesion is poor, the paint will tend to flake away from a cut. An adhesion test should also give an indication of the number of coats; color of finish versus primer (which would be orange if pigmented with red lead or bright colors such as yellow if pigmented with lead chromate); and thickness of layers. Of course, other colors of lead-based paint may also be present. Any damage resulting from an adhesion test should be repaired immediately in a manner that restores the integrity of the primer and finish coats to prevent subsequent deterioration.

When it can be determined that lead-based paint is present in a field-applied coating over an intact factory-applied primer, and paint removal is the abatement method of choice, only the field-applied finish coatings need to be removed. An intact primer need not be removed.

4. Kitchen and Bathroom Cabinets

Old lead-based painted kitchen and bathroom cabinets can be removed and replaced. Affected cabinets should be removed as described above. Lead-based paint on walls to which cabinets are attached should not be disturbed during cabinet removal. Applying masking tape around the cabinet perimeter and vacuuming immediately after removal will help to control leaded-dust.

5. Railings

Railings include the railing caps, banisters, posts and spindles (balusters), and newel posts that can be removed and replaced (see Figure 12.5). Railings may or may not be part of a stair system. Affected components should be removed as described in Section B. New lead-free components should be installed in a professional manner using standard carpentry practices. Metal railings and other grillwork can be removed and taken off-site for contained abrasive blasting or other forms of paint removal, then reinstalled after repainting. See Section II.C.3, above, regarding lead-containing factory-applied primers.

FIGURE 12.5 A metal railing before abatement.

6. Exterior Siding

Many materials are used on a dwelling's exterior walls. Materials of concern are generally painted wood or brick. Under most conditions, deteriorated siding identified as a lead hazard will be abated through enclosure without removing the original material. However, in restoration or historically significant projects, it may be replaced. Siding is now available that closely resembles wood. If the siding is to be replaced, the affected siding should be removed. Care must be taken to avoid contamination of soil walkways, window air conditioners, and the building interior (see Figures 12.6 and 12.7).

FIGURE 12.6 Installation of replacement siding.

FIGURE 12.7 Certified workers are needed to replace siding when the project's intent is lead abatement.

7. Interior Walls

If abatement is performed along with gut rehabilitation, old lead-based painted interior walls and ceilings may be removed and replaced. This activity, unlike those previously described, is more like demolition work. In addition to the layers of heavy duty plastic used to protect the floors from contamination, sheets of plywood should be placed over the plastic to protect it from damage during aggressive demolition, and to make cleanup of debris easier. Prior to demolition, affected areas should be sprayed lightly with water. Workers should wear ribbed rubber boots when walking on slippery, wet plastic. If ladders must be used, the plastic should be punctured to provide secure anchoring of the footings to the surface underneath. Ladder footings should not be placed on top of the plastic because this will create a slip hazard. Excessive water should not be applied, and the creation of puddles and streams that may flow through breaks or gaps in the containment should be prevented.

Removing plaster walls as a means to remove all of the old lead-based paint generates a great deal of dust. Unless this is required as part of a renovation occurring at the time of the abatement, the option of enclosure should be considered when determining abatement strategies.

D. Transportation and Storage of Waste

Building component replacement and demolition generate a considerable amount of waste material. Lead-contaminated building components and demolition debris should be handled carefully (see Chapter 10). Bulk debris such as doors, windows, and trim should be wrapped in durable puncture resistant plastic sheeting and sealed with tape. Smaller debris should be swept into heavy duty plastic bags after spraying. Exterior ground surfaces must also be protected. Outside storage needs to be secure and protect the ground (see Figure 12.8)

All debris should be removed from the site as soon as possible. In larger jobs where a dumpster is being used, it may be possible to eliminate the wrapping and bagging of bulk debris as long as the dumpster has a lockable lid and is lined with plastic and secured with a fence and signs.

FIGURE 12.8 Line surfaces with plastic in the work area (left) and pathways (right)

Contaminated building components and demolition debris should be transported in covered vehicles to an appropriate disposal facility. Old building components coated with lead-based paint should not be recycled unless the paint is removed beforehand. See Chapter 10 for a full discussion of waste disposal.

III. Enclosure Methods

A. Definition

Enclosure is the installation of a rigid, durable barrier that is mechanically attached to building components, with all edges and seams sealed with caulk or other sealant. Surfaces with lead-based paint are enclosed to prevent access and exposure and to provide a dust-tight system. Unlike encapsulation, the enclosure system is not dependent on the painted surface of the substrate for its durability. Enclosures should have a design life of at least 20 years. While adhesives are frequently used for initial mounting purposes and for assistance in covering the lead-based painted surface with the enclosure material, it is primarily mechanical fasteners that give enclosures their longevity.

Standard construction materials are employed to create a solid and relatively rigid end product (see Appendix 7.2 for a description of materials commonly employed for lead-based paint enclosure). The primary differences between enclosure for lead-based paint and ordinary construction include careful sealing of all edges, joints, and seams to create a dust-tight (not necessarily air-tight) enclosure; site containment; worker safety (particularly during any needed surface or substrate repairs); and special cleanup. There is generally little or no hazardous waste disposal and little degradation of the lead-based paint as part of the enclosure process, unless substrate repairs are necessary. The hazard and expense of removing deteriorated paint can be avoided when the enclosure material is mounted flush to a structurally sound lead-based painted substrate and all the seams are sealed. This method produces little leaded-dust (HUD, 1991). These advantages hold down labor costs compared to paint removal and building component replacement, although cleanup and clearance are still required. A lower level of containment can often be used as less dust is generated.

For broad surfaces such as walls, ceilings, floors, and siding, enclosure is often considerably cheaper and less hazardous than building component replacement and paint removal. However, enclosure does not remove lead-based paint from the property; instead, it makes the dwelling lead-safe.

B. Longevity of Enclosures

There is little doubt that hurricanes, earthquakes, tornados, and flooding can substantially compromise an enclosure's viability. Less dramatic but more common events can also increase the risk of lead exposure, such as damage to the enclosure by the occupant or water damage from a leaking roof, overflowing tubs, or broken pipes. Any type of enclosure is potentially vulnerable to water damage. Future occupants can also be threatened by remodeling endeavors that break through the enclosure.

1. Labeling of Surfaces to be Enclosed

A few simple procedures should be followed to promote lead safety in case an enclosure is breached. The surface to be enclosed should be labeled with a warning, "Danger: Lead-Based Paint." The label, spray-paint, or stamp lettering should be in permanent ink.

A durable drawing of the property floor plan should be mounted on a sturdy metal or wood base and affixed with screws to a wall in the utility room next to the electrical panel or at any other closet location that can be easily seen by maintenance personnel (see Figure 12.9). The drawing should be covered with plastic for protection. Enclosures should be highlighted on the diagram and identified as hazardous. (For a multi-family property, another copy of the drawing should be maintained in the property management office's file.)

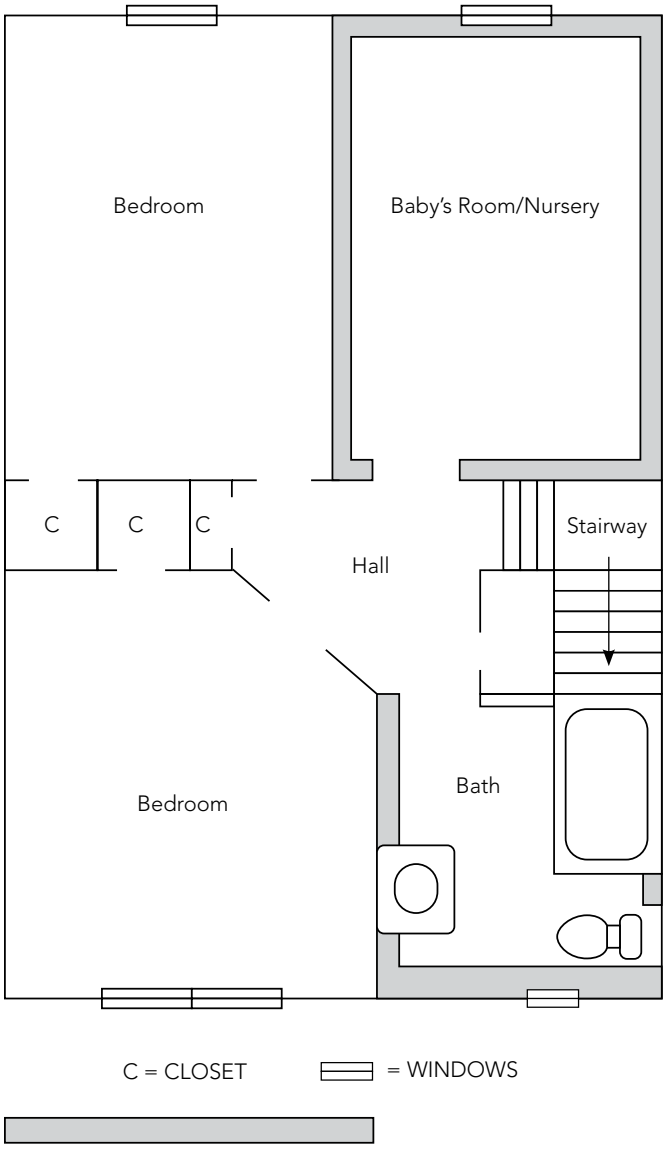

FIGURE 12.9 Example of a Diagram Showing the Location of Lead-Based Paint Enclosures.

2. Unsound Substrates

Any substrate material can be enclosed, including plaster, concrete block, brick, and concrete. All soft, moveable, or otherwise structurally unsound structural members should be repaired prior to enclosure if they are needed to support the enclosure. If repair is not feasible, then the defective area will need to be removed and enclosure will not be possible. Hazards associated with preparing the site for enclosure increase as more remedial work is needed. Structural repairs may require lead-based paint removal or component replacement, with all the accompanying safety protocols these practices entail. If the substrate is sound but the paint is deteriorating, stabilization or removal of deteriorated paint before the enclosure is installed should *not* be done because it will generate dust.

3. Ongoing Monitoring and Reevaluation

Because the building components used for enclosure may be impacted during building use, or may shift or deteriorate, the property owner or manager must arrange for regular monitoring and repairs, as needed. Visual monitoring should be performed no less often than every two

years. If signs of wear or deterioration are apparent from visual assessments or other observations by maintenance and repair workers or during any reevaluation examination, the enclosure should be repaired using lead-safe work practices using a certified firm and workers, followed by clearance. In addition, residents should be instructed to notify management of the need for repairs on a timely basis. For HUD-assisted housing that is subject to periodic reevaluation, the monitoring of the performance of the enclosure should be part of that reevaluation to determine if deterioration or failure of the enclosure has occurred since the previous reevaluation.

C. Interior Surface Enclosure Materials

1. Wood Paneling

Wood paneling is an appropriate enclosure material, except for ceilings. It is of limited use, however, because of the difficulty of sealing seams around electrical outlets, switch boxes, and heating, ventilation, and air conditioning (HVAC) registers. There should be no gaps in the seams, outlets, boxes, and registers, which should all be screwed directly to the paneling and to any framing behind the panels. All seams should be caulked. Paneling made of composite board backing materials is vulnerable to dampness, particularly in below-grade situations such as basements. In some instances, the use of these materials may violate building and/or fire codes. On the other hand, plywood paneling may be stronger, more impact resistant, and more water resistant than other enclosure materials, such as drywall.

Paneling can be glued and mechanically fastened directly to the substrate, but the appearance is improved when the area to be covered is first furred or framed out and the paneling is anchored to these braces. The paneling should not extend past the depth of door or window frames or other trim pieces. Baseboards can be removed and the new cove base then glued directly to the paneling. Even heavy grades of paneling flex and vibrate when receiving mild impact. Over time, this could compromise the seal of the seams that join the paneling with other building components. Joints and edges must be fully supported; furring strips should be installed at the appropriate distance from each other, usually 12 inches apart. All seams at these transition points should be caulked before panel trim and corner moldings are installed as finish pieces.

2. Laminated Products

Laminated wall sheeting products, such as Marlite™, are designed to withstand surface moisture and are commonly used in bathrooms and kitchens. Their surfaces have a high sheen and clean easily. However, they may become defective when moisture gets behind the board's placement. This can occur from a leaking pipe or a seam opening in the bathtub/ shower area. When a significant leak is detected, the enclosure must be reexamined.

3. Rigid Tile and Brick Veneers

Plastic and ceramic tile, synthetic brick and stone veneers, and other similar products are either glued or cemented directly to the painted surface. These products qualify as rigid encapsulants rather than enclosures because they are not mechanically fastened to the substrate. Regardless of whether they are enclosures or encapsulants, they tend to be inappropriate for broad application: The cost associated with labor and materials is often prohibitive for anything more than incidental use.

4. Drywall and Fiberboard

The steps to install drywall and fiberboard are shown in Table 12.3 and detailed specifications are provided by the Gypsum Association in Washington, DC (202-289-5440) Application and Finishing of Gypsum panel Products (GA-216-04). Available at ***http://www.gypsum.org/download.html***.

Gypsum drywall or fiberboard is a very common and cost-effective interior finish. It is not difficult to locate skilled workers to install this product. Training materials are available from trade groups (Gypsum Association, 2004). When applied directly to a surface, the drywall is generally glued in place with construction adhesives and then mechanically fastened to the studs or structure behind the plaster. The screws must be long enough to go through the drywall, the plaster, and the wire mesh or lath and extend an inch into the stud or structure. To avoid having dust escape from the screw hole as the drilled screw displaces plaster, a dab of shaving cream can be applied to the area to be drilled.

Moisture-resistant greenboard should be installed in damp areas. It is difficult to completely control the long-term damaging effects of a severe moisture problem without invasive waterproofing and/or water diversion from the exterior of the property. Any type of enclosure is potentially vulnerable to water damage.

Table 12.3 Steps To Install Drywall and Fiberboard on Interior Walls.

- Check to make sure the depth of the trim will accommodate the thickness of the drywall (minimum of 3/8 inch preferred). If it does not, this method may not be suitable.
- Set up the plastic containment of the work area (see Chapter 8).
- Remove any trim being disposed of, and install the drywall over any cavity left by the removed moldings, except large cavities over 16 inches in any direction. Repair any structural deficiencies.
- Repair or remove any "soft" wall areas. Removal of painted plaster generates a great deal of leaded-dust.
- Use construction adhesive to glue the drywall directly to the surface being enclosed.
- Screw the drywall to the studs behind the existing wall. Caulk all seams that meet molding.
- Use extension rings to bring out electrical devices flush with the new gypsum based drywall and retrofit any HVAC registers. Caulk all seams.
- Tape and finish the drywall.
- Prime and paint the finished area, as well as the unenclosed surfaces in the same room so that all walls match the new installation. (See specifications and recommendations from the Gypsum Association.)

Quarter-inch thick drywall tends to conform to the contours and imperfections of the original substrate or wall, compromising the appearance of the finished product. To avoid this, use of 3/8-inch thick (minimum) drywall is recommended. The enclosed wall may in fact look much improved over the original wall. If the original wall surface is highly irregular, it may be necessary to install furring strips 12 inches apart and use 1/2-inch thick drywall to improve the appearance. If 1/4-inch thick drywall is used, it must be applied in accordance with the manufacturer's specifications (Gypsum Association, 2004).

D. Interior Building Components Suitable for Enclosures

All joints between drywall pieces should be taped and spackled with joint compound. Wherever the drywall meets wood framing or any other finish material (including electrical devices and HVAC registers), the seams should be sealed with a caulk or other sealant that has at least a 20 year warranty. Similarly, where sealed pipes penetrate an enclosure, the opening around the pipe must be sealed. Drywall is painted when installation is complete. Fastening schedules are available from industry trade groups (Gypsum Association, 2004).

1. Wood Trim and Drywall

The profile of the wood trim on windows and doors must be evaluated before overlaying an adjacent wall with drywall; the wall finish should protrude past the depth of the moldings. In homes built before 1960, this problem is less frequent because the trim tended to be more ornate and generally of thicker wood. Regardless of age, the problem is more likely to occur in multi-family public housing and institutional settings where the construction is basic and trim is thin.

If the drywall overlay is too thick, it may be possible to remove the baseboard and run the drywall to the floor. The baseboard can then be reinstalled over the new drywall (unless the baseboard itself presents a lead hazard, in which case it should be replaced). Obviously, care must be taken to avoid breaking the original baseboard during its removal. The seam at the bottom of the drywall should be sealed with caulk prior to the installation of the baseboard or cove base.

2. Electrical Outlets and Vents

All electrical devices, including switches and outlets, will need extension rings to bring those fixtures out flush with the new drywall overlay. A sealant or caulk should be used at cutouts for electrical boxes. Similarly, all grillwork at openings for heat vents and cold air returns should be retrofitted. These are minor but necessary steps in the drywall enclosure process.

3. Ceilings

Ceilings are more difficult to enclose than walls. Drywall applied directly to the ceiling will frequently result in an uneven appearance because there may not be a smooth transition from one board edge to the next. The solution is to draw a chalk line, usually every 16 inches on center, so that metal hat channels (or metal furring channels) or wood furring strips can be screwed into each ceiling joist. Three- to four-inch screws should be used to ensure that the screw penetrates the hat channel, plaster (or other substrate), and the wire mesh holding the plaster enough to bite firmly into the joist. The hat channel may be shimmed to get a perfectly level finished surface.

Next, the drywall should be affixed to the hat channel for an excellent finished product. An

extension ring will be needed for ceiling light fixtures. Prior to lowering the ceiling slightly, the contractor should be confident that there is no interference with the top of ornate, oversized window frames, pipes, vent covers, or crown moldings. The overall height of the lowered ceiling should conform to building code clearances.

All screws for furring channels or strips must penetrate into the ceiling joists prior to installation of the drywall. On occasion, some multi-family housing or commercial buildings converted to residential use may have cast-in-place, reinforced concrete ceilings. Anchoring supports for the new ceiling may not be practical in these instances. Though this construction is generally very strong, a structural engineer should be consulted about attaching a drywall system to the concrete. On-site architectural or engineering advice is needed on a case-by-case basis to determine if this approach is appropriate.

Acoustical lay-in panels (drop-in ceilings) do not constitute lead-based paint enclosures; they will not adequately guard against the escape of leaded-dust into the living space and cannot be sealed.

4. Floors

Lead-based painted floors should be enclosed with 1/2-inch or thicker plywood or other underlayment (see Figure 12.10). The joints in underlayment should be flash patched. Shoe molding running along the baseboard should be removed before plywood installation and reinstalled when the finished floor is completely in place. If the shoe molding contains lead-based paint, new shoe molding should be installed since new molding is inexpensive and more cost effective than removing the paint from the old shoe molding. This will ensure that all floor covering runs tight to the baseboard and the joints at vertical surfaces are covered by the quarter-round molding. The plywood should be covered with vinyl tile or sheet goods to provide a cleanable surface. Covering the plywood with wall-to-wall carpeting is generally not recommended because the carpet does not provide a sealed top cover and is harder to clean. Vinyl floor coverings should be finished off with a metal threshold at all doorways or at any access to an uncovered open floor to protect the exposed edge. When placing tile over old flooring, a row of nails (preferably screws) should be run a few inches apart in a straight line over each joist before the plywood is put down. Old floor nails often lose much of their grip, which results in squeaky floorboards. This movement can in turn cause the edges of floor tile to lift in spite of the plywood underlayment that was installed. It is most important to remember that all the plywood sheets must be installed flush with each other. Gaps must be filled with flash patching cement. Also, a bead of caulk should be run at the edge of every board before it is set in place. All nails must be hammered flush and all dirt vacuumed thoroughly; otherwise small lumps will eventually appear in the soft vinyl finish goods.

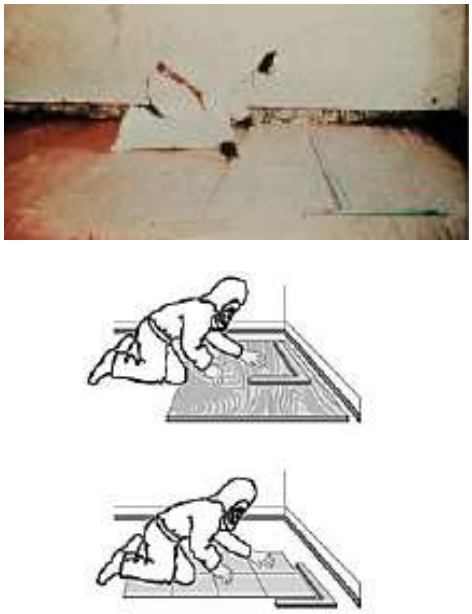

FIGURE 12.10 Install underlayment and new flooring as a suitable LBP enclosure method. The personal protective equipment is for a high-dust project.

If the floor to be enclosed is poured slab or cast-in-place concrete, the surface will have to be predrilled to accept each screw that anchors the plywood enclosure. A structural engineer should be consulted for situations other than slab-on-grade construction. Floor adhesive can offer an added measure of reinforcement and sealant. Each screwhead should be just

below the level of the underlayment top surface and, along with the seams, should be covered with a smooth coat of flash patching cement to prevent dimples in the vinyl top cover.

5. Stairs

Dirt and loose paint should be removed prior to enclosure. Defective paint should be wet scraped and vacuumed; protective gear should be worn by the workers; and the work area should be contained with 6-mil plastic (or equivalent). In multi-family housing, common stairways must be accessible to residents and workers during the construction work to avoid a fire code violation.

FIGURE 12.11 Enclosed stairs.

Wooden steps with lead-based paint should be completely covered with vinyl or rubber treads and risers. These materials should have a minimum specification that would qualify for Federal Housing Administration (FHA) product approval or should be commercial grade. The vinyl should be stapled as well as glued with floor adhesive to avoid sagging. Long staples are preferred to reinforce the tread cover at this critical point and prevent the vinyl from being pulled up by the toe of a shoe. Metal bull nosing can also be used at this wear point.

In addition, long staples or metal bull nosing should be used at the end of the vinyl that butts up tight to the wood riser of the next step.

Plywood can be used to cover step risers and squared-off treads. Plywood is also useful as additional protection, supplementing the vinyl covers mentioned above. Precast concrete steps will have to be drilled, screwed, and glued to anchor the covers in place.

6. Pipes

Painted pipes can be enclosed with the same tape used to make plaster casts, which provides a hard-finished end product. Loose paint and dirt should be safely removed first. The wrapped tape should overlap itself so that it is not dependent on adhering to the painted surface.

Pipes can also be enclosed with drywall. However, this type of enclosure will insulate and limit the ability of radiator pipes carrying steam or hot water to contribute to household heating.

7. Door Frames

Preformed metal door buck or frame covers come in standard sizes to accommodate most components, and as such they can be used to enclose both wood and metal door frames, either interior or exterior. All seams must be caulked. Primers on such bucks should be lead-free.

8. Plywood Enclosures

Knee walls, painted structural supports, and trim such as baseboards, skirt boards, and stringers can be enclosed with plywood that is cut to fit tightly. These items should be sealed with

adhesive and nailed. All joints should be caulked.

E. Exterior Enclosure Systems

1. Siding

Vinyl or aluminum siding may be used to enclose painted exterior surfaces. In addition, porch columns (both square and round) and porch ceilings can be enclosed with these materials. Aluminum coil stock can be used on soffits, fascia, bargeboard, decorative crown moldings (though original detailing will be lost), door and window frames, parapets, and other moldings. All seams need to be caulked and back-caulked. Soffit coverings under roof areas often need to be vented to prevent dry rot (see Figure 12.12). However, as old paint degrades behind this covering, a small amount may migrate through the vents. Breathable cloth materials such as Tyvek™ or an equivalent are available in rolls for this purpose and can be installed before the aluminum covering is put in place. The breathable cloth materials will help prevent leaded-dust from escaping through gaps in the new siding, although it will be necessary to leave attic vents uncovered to permit adequate ventilation. Vent openings should not be covered with Tyvek™ or other similar covering. Because siding may not provide an airtight enclosure, rigid or flexible dust barriers like Tyvek™ should be installed before broad surface enclosure. Perforated metal stock should not be used to enclose soffits, fascia, or eaves as the enclosure is not dust

Create a dust-tight seal

Paint deteriorates more quickly behind an enclosure. All edges of an enclosure—especially the bottom—must be sealed well.

Seal the bottom edge

- Caulk the enclosure material at the bottom
- Back-caulk the nail and baseboard in place.
- Back-caulk, bottom-caulk, and nail the shoe molding in place.

Seal the seams and other edges

- Back-caulk all the seams that aren't taped and spackled. Use a high quality adhesive caulk.
- Use a "J-channel" where drywall meets a finished surface. A J-channel is a final strip attached to the rough edge of drywall to make a finished edge. It's called a "J-channel" because of its shape. Caulk the outside edge so it seals with the finished surface. Screw the drywall in place.

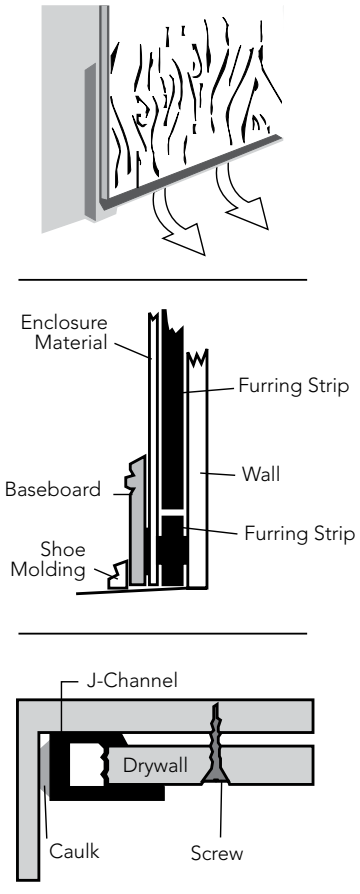

FIGURE 12.12 Seal All Seams for Enclosure.

tight. Rotten or loose wood and any other defective substrate must be repaired or replaced to provide a sturdy foundation for the siding installation and edges.

2. Windows

For standard sized windows, snap-in replaceable aluminum and vinyl tracks are available. These devices help eliminate the painted friction point (and thus the generation of leaded-dust) where the moving sash abrades the painted surface. The track covers should be pressed into a bead of caulk at each joint. Painted sashes should be planed to remove lead-based paint and then reinstalled (see Chapter 11, Section IV). Friction surfaces on windows should not be painted.

Window troughs should be covered with fitted metal and screwed into place. Again, the metal should be pressed into a bead of caulk at the joints and edges.

3. Exterior Walls

Board products made of various materials (e.g., synthetic fiberboard, wood byproduct composites, and cementitious materials) are commonly used in the construction industry for exterior purposes. These heavy, sometimes brittle coverings often have resins, fiberglass, or other durable ingredients that make them resistant to weathering and may require little maintenance, including painting. An added benefit of using these products is that they may have thermal insulation value. The products are best installed over flat surfaces that are not soft, crumbling, unstable, or otherwise defective. A defective substrate must be repaired prior to enclosure. All joints need to be sealed after installation.

Properly installed, natural or synthetic brick and stone veneers can be used to enclose exterior walls. In addition, stucco can be used as a covering material using wire mesh to physically anchor the cement to solid building components. A defective, weak surface needs to be stabilized before covering. Vinyl and aluminum siding are usually the least expensive options.

F. Summary

Enclosures are solid materials that are physically anchored to building components and that cover lead-based paint. Enclosure usually involves common construction techniques and has a 20-year design life. The enclosure abatement option is an effective, stable remedy for minimizing the danger of lead-based paint exposure. Because any barrier can be breached, annual monitoring by the owner and reevaluation by a certified risk assessor or inspector technician are necessary.

Enclosure may be less hazardous and cheaper than paint and building component removal. There is less dust generated and little hazardous waste disposal. Unlike encapsulation, the enclosure is not dependent on the adhesion of the underlying coats of paint on the substrate surface for its durability, nor does it require deteriorated paint removal or surface cleaning and deglossing before installation.

Drywall is often a cost-effective interior finish, and aluminum or vinyl siding provides an acceptable exterior barrier. Aluminum coil stock is effective for enclosing outside trim. Floors require underlayment and vinyl or other sheet finish goods. Vinyl or rubber tread and riser coverings are recommended for steps.

IV. Paint Removal Methods

A. Introduction

Paint removal means the separation of the paint from the substrate using heat guns, chemicals, or certain contained abrasive measures, either on-site or off-site. As an abatement technique, paint removal is usually reserved for limited areas and for those surfaces where historic preservation requirements may apply.

While paint removal can be performed safely and effectively, it also demands the highest level of control and worker protection for several reasons. Paint removal usually creates the greatest hazard for the worker, either from the hazards associated with the removal process (e.g., heat, chemicals, and sharp tools) or from the lead that becomes airborne or is left as a residue on the surface after removal. On-site paint removal will usually be a high-dust job. Prepare the worksite in accordance with the guidance in Chapter 8. Lower levels are possible if the size of the area to be treated is small (see Chapter 8). Because of the lead residues left behind by all paint-removal methods, particularly on porous surfaces such as wood or masonry, more extensive cleaning is usually required to meet clearance criteria. Paint removal methods also generate a significant amount of waste and may be the most costly of all lead abatement methods (HUD, 1991).

All work involving lead-based paint should be performed in a manner that minimizes all dust production. All high-dust paint removal operations should be avoided, and all work be planned and designed to reduce all dust generation. Using work practices and procedures such as wet work practices and the use of tools with attached HEPA-vacuum exhaust will help protect children, workers and residents.

In spite of these limitations, paint removal has the benefit of a low reevaluation failure rate. If some lead-based paint is left in the dwelling, its condition will need to be monitored by the owner (see Chapter 6).

B. Prohibited Methods

Certain methods of lead-based paint removal are absolutely prohibited, either because of unacceptably high worker exposures to lead or release of lead into the environment through production of dust or fumes or both.

1. Open Flame Burning or Torching

Burning, torching, fossil fuel-powered heat plates, welding, cutting torches, and heat guns operating at temperatures greater than 1100°F are prohibited as a means of paint removal because of the high temperatures generated in the process. So-called heat plates (those using propane to heat a grid, which in turn heats the paint) are also prohibited because of the high temperatures generated. At these temperatures, lead fumes may be produced.

Lead fumes are formed when lead is heated into a gas. The gas cools when it comes into contact with the cooler surrounding air and condenses into very small particles. These particles travel easily, are readily inhaled and absorbed into the body, and are difficult to cleanup. Several researchers have found that worker exposures are extraordinarily high when doing this kind of work (NIOSH, 1992a; Jacobs, 1991b; Rekus, 1988). The fumes may also travel throughout

the dwelling, contaminating all surfaces with which they come into contact. Other hazardous substances may be released from the paint film using heat.

Using cutting torches to remove fire escapes, railings, or other metal components coated with lead-based paint is also prohibited unless the paint is removed first. Similarly, welding of painted metal components (such as pre-primed structural steel) is prohibited by Occupational Safety and Health Administration (OSHA) regulations (29 CFR 1926.354(d)).

2. Machine Sanding or Grinding Without a HEPA Exhaust Tool

Machine sanding or grinding is prohibited (regardless of the grit used) because of the large volume of leaded-dust generated (see Figure 12.13). As a result of these methods, workers have been exposed to extremely high leaded-dust levels, and blood-lead levels in resident children have increased (Amitai, 1991; Farfel, 1990; Jacobs, 1991b). However, machine sanding with a HEPA abatement exhaust tool *is* permitted and is discussed further below. Extensive dry hand sanding is not recommended, but wet sanding can be done if no electrical outlets are nearby. Limited dry sanding or scraping near electrical circuits is permitted.

3. Abrasive Blasting or Sandblasting

Traditional abrasive blasting or sandblasting is prohibited in residential structures, regardless of whether the abrasive material is recycled or if the area is fully contained. These methods

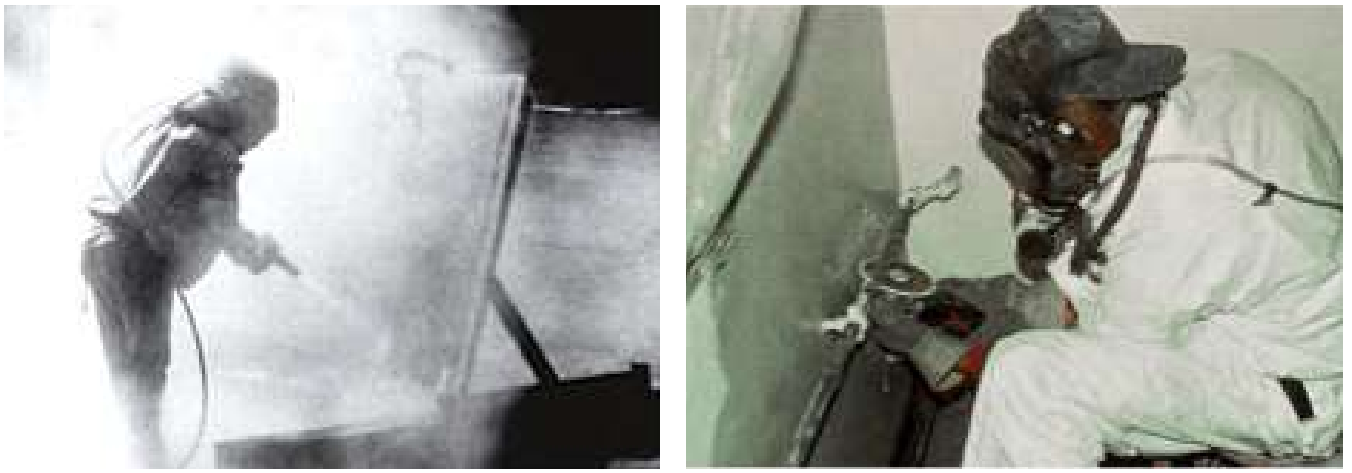

FIGURE 12.13 Prohibited work practices (traditional abrasive blasting (left) and grinding without HEPA exhaust).

produce widespread dust contamination; full containment is nearly impossible to maintain and guarantee in a residential environment. Abrasive blasting should only be done using HEPA vacuum local exhaust equipment, discussed below.

If abrasive blasting must be done in a residential structure, the area must be sealed and placed under negative pressure with enough clean fresh air so at least 10 times the volume of air in

the contained space is brought in to the space and, after filtration, exhausted from it each hour (i.e., the ventilation rate is at least 10 air changes per hour) to ensure the dust can be controlled. If the exterior must be blasted, the entire building must be covered with a tent and placed under negative pressure with at least 10 air changes per hour. In both cases, all exhaust air must be passed through a HEPA filter. Fresh air should be provided to the containment zone at a lower rate than the exhaust airflow to maintain the negative pressure zone.

4. Heat Guns Above 1100° F

Heat guns operating above 1100° F or charring the paint should not be used. See discussion of operating heat guns below 1100° F in section IV.C below.

5. Dry Scraping

Dry scraping is not recommended because of the large volume of particulate matter that is generated (including high levels of leaded-dust).

The two situations where dry scraping is appropriate are scraping surfaces near electrical outlets, which cannot be wet scraped because of the obvious electrocution hazard, and scraping when using a heat gun as this cannot be done wet. For both of these cases, dry scraping is only appropriate for limited surface areas.

6. Chemical Paint Stripping in a Poorly Ventilated Space

Workers should not remove paint in poorly ventilated space when using a volatile stripper that is a hazardous substance in accordance with regulations of the Consumer Product Safety Commission (CPSC) at 16 CFR 1500.3 and/or a hazardous chemical in accordance with the OSHA regulations at 29 CFR 1910.1200 or 1926.59, as applicable to the work. (This practice is prohibited by HUD regulations but not explicitly by EPA regulations as of the publication of the second edition of these *Guidelines*.)

Paint strippers with methylene chloride should be avoided. OSHA has found that adults exposed to methylene chloride "are at increased risk of developing cancer, adverse effects on the heart, central nervous system and liver, and skin or eye irritation. Exposure may occur through inhalation, by absorption through the skin, or through contact with the skin." (62 FR 1493, January 10, 1997). OSHA's permissible exposure limit for methylene chloride in air was reduced in 1997 from 500 to 25 parts per million (29 CFR 1910.1052 for general industry, and the identical 29 CFR 1926.1152 for construction). Methylene chloride cannot be detected by odor at the permissible exposure limit, and organic vapor cartridge negative-pressure respirators are generally ineffective for personal protection against it.

Alternative paint strippers may be safer, but have their own safety and/or health concerns, so all paint strippers must be used carefully. Always follow precautions provided by the manufacturer. It is especially important that people who use paint strippers frequently not use such chemicals in a poorly ventilated area. If good ventilation is not possible, professionals equipped with protective equipment should perform the work in accordance with CPSC regulations (16 CFR 1500.3) and/or OSHA's hazard communications standards (29 CFR 1910.1200 or 29 CFR 1926.59, which are identical) and with any substance-specific standards applicable to the work.

CPSC and EPA recommend that people who strip paint provide ventilation by opening all doors and windows and making sure there is fresh air movement throughout the room ("What You Should Know About Using Paint Strippers," CPSC Document 4423, and EPA Document EPA 747-F-95-002). (***www.cpsc.gov/CPSCPUB/PUBS/423.html***)

C. Recommended Methods of Paint Removal

1. Heat Guns

Open flame burning is prohibited, so removal methods using heat are limited to electric powered flameless heat guns (see Figure 12.14).

Before beginning work, fuses and an adequate electrical supply should be verified. Larger fuses should not be installed because of the possibility of creating a fire hazard. A portable electric generator may be needed, especially if several heat guns will be required. Care should be exercised around wallpaper, insulation, and other flammable materials. An accessible garden hose with a pressure-release spray nozzle, a crowbar to remove smoldering wood, and a long-handled sledgehammer to open up walls exposed to smoldering insulation should be readily available. Under OSHA regulations (29 CFR 1926.150), a fully charged ABC-type 20-pound (minimum) fire extinguisher must be available within 100 feet of the work area. Work should be conducted only in well-ventilated spaces. Other hazardous materials may be released when old painted surfaces are heated (NIOSH, 1992a).

FIGURE 12.14 Using a heat gun to remove paint is labor-intensive.

While there is little risk that dangerous levels of lead fumes will be produced at temperatures below 1100°F, significant airborne particulate lead is generated by the accompanying scraping of the paint. Also, significant amounts of potentially harmful organic vapors can be released from the action of the heat upon the paint, even at temperatures below 1100 °F. For this reason, air-purifying respirators should be outfitted with both a HEPA-filtered cartridge and an organic vapor cartridge. Organic vapor cartridges may not be available for some powered air-purifying respirators.

Depending on the size of the area and the substrate, paint removal by heat gun can be a slow, labor-intensive process and may result in a high final clearance failure rate if used extensively and without proper cleanup. Removing paint completely, particularly from crevices, requires attention to detail. Significant leaded residue may remain on surfaces unless cleanup is thorough. Heat guns do not appear to be particularly effective on metal or masonry substrates, which are too porous to be scraped effectively; the heat may cause small particles to fly up and hit the worker, causing burns or eye damage. Although heat guns work well on wood, they will usually damage drywall and plaster.

Workers may tend to place the nozzle of the heat gun too close to the surface, burning out the heating elements prematurely, sometimes inadvertently even if they have been trained not to do so. One way to prevent this is to attach a small metal wire cage or extension tube to the

end of the heat gun to prevent it from being placed too close. For most heat guns, the optimal distance from the surface is 3 to 6 inches. The heat gun is recommended only for limited surface areas in well-ventilated spaces. Other problems with heat guns include additional fire hazards from dry rot, insulation, and dust, especially in window troughs, roof areas, and hollow porch columns. Scraping often leaves the substrate very rough and may singe adjacent wallpaper. Telephone wires mounted on baseboards can melt, and heat can crack glass with a cold exterior or dry glazing.

To use heat guns properly, allow the heat stream leaving the gun to merely soften the paint. Do not allow the paint film to scorch or smoke. Scrape the loose paint off the surface at the very first sign of paint softening, blistering, or bubbling.

2. Mechanical Removal Methods

HEPA Sanding

HEPA sanders are valuable for surface preparation prior to repainting. As chemical stripping sometimes raises the grain of the wood and some removal methods are not effective at removing all visible traces of paint, some sanding prior to repainting may be needed. Manual sanding can generate significant levels of airborne and settled lead-dust; airborne levels more than 10 times OSHA's permissible exposure limit, have been observed (Zhu, 2012). Therefore, HEPA-assisted sanders are recommended whenever sanding must be done. HEPA sanders do not work well on detailed moldings. In such situations, chemical stripping, use of a heat gun or offsite removal may be suggested.

HEPA sanding uses traditional electric sanders, such as disc sanders or orbital or vibrating sanders, equipped with specially designed shrouds or containment systems that are placed under a partial vacuum (also known as local exhaust ventilation). All exhaust air is passed through a HEPA filter (often using an ordinary HEPA vacuum) to reduce the amount of airborne particulate lead (see Figure 12.15). The HEPA vacuum must be correctly sized to provide adequate airflow to permit the system to operate properly. If hoses are longer than normal, a larger HEPA vacuum may be needed to handle the increased pressure drop.

FIGURE 12.15 HEPA-filtered power tools.

There are two main types of HEPA sanders. The first uses a flexible shroud to surround the sanding head, with the HEPA vacuum hose attached to the shroud. The shroud must be

in constant contact with the surface to be effective. If the shroud extends beyond the surface being sanded, large amounts of particulate lead will be released into the air. In addition, this configuration makes it impossible to sand to the edge of protruding surfaces, such as baseboards or window and door casings.

The second type of HEPA sander pierces the sandpaper with holes through which the vacuum draws the dust. This allows the instrument to be used to the edge of protruding surfaces. However, care must be exercised to keep the sandpaper flat on the surface. Neither one of these methods is completely effective; respirators are always recommended. Worker fatigue can also prevent the worker from holding the tool flush with the surface, making it necessary to provide frequent breaks or rotate workers.

Wet Scraping

FIGURE 12.16 Wet scraping (left)
FIGURE 12.17 Scraping tools (right).

Wet scraping is feasible on most surfaces and results in lower lead exposures than dry scraping. Since surfaces near electrical outlets should never be moistened (due to the electrocution hazard), these areas should be dry scraped.

Wet scraping can be performed by using a spray bottle or sponge attached to a paint scraper (see Figure 12.16 and 12.17). Wet scraping is often used to remove loose and flaking paint before paint film stabilization or encapsulation. If wet scraping is employed as an abatement technique, a more durable covering than new paint is needed. Working a few square feet at a time, the worker should mist the surface lightly using a garden sprayer or plant mister. Loose material should be scraped from the surface and deposited on the containment plastic with a paint scraper. Damp paint chips should be cleaned up as soon as possible so that they are not tracked throughout the work area or crushed beneath the feet of workers.

Scraper blades should be kept sharp to minimize abrasion and gouging. Additional scraper blades should be on hand and should be selected for the type of surface being scraped. To obtain a smooth finish, it may be necessary to follow wet scraping with wet sanding. A variety of scraping tools are available from hardware and paint supply stores.

HEPA Vacuum Blasting

HEPA vacuum blasting is simply abrasive blasting with a shroud under a vacuum that is attached to the blast head. All exhaust air is passed through a HEPA filter, using a properly sized HEPA vacuum system. Vacuum blasting is appropriate for metal, brick, concrete, and other masonry surfaces. To date, attempts to use the process on wood, plaster, and other soft materials have

FIGURE 12.18 Vacuum blasting is not often used on housing.

FIGURE 12.19 Needle Gun with HEPA Exhaust Ventilation.

not been successful, as they usually cause severe substrate damage.

Various blasting media can be used (e.g., aluminum oxide, metal shot, walnut shells) depending on the type of substrate. Blast heads, usually a brush-type arrangement, come in various sizes and shapes. The blast head must remain in continuous contact with the surface to avoid dispersal of both the blast medium and particulate lead (see figure 12.18). The equipment can be outfitted with a device that separates the blast media from the paint, effectively recycling the blast material, and dramatically reducing the volume of waste. This is particularly important because the blast material should be disposed of very carefully (see Chapter 10).

Use of the equipment for long periods of time can result in worker fatigue, particularly if working with the arms above the head. Fatigue can cause a worker to momentarily lose contact with the surface, resulting in the release of leaded dust, so the goal is to minimize the degree to which workers must reach above their shoulders. Scaffolding and platforms should be constructed to minimize such stress, and frequent work breaks should be taken. Vacuum blasting is not typically used in interior residential work.

HEPA Vacuum Needle Gun

The HEPA vacuum needle gun is similar to vacuum blasting in concept but avoids the use of a blast medium (see Figure 12.19). In the vacuum needle gun, metal needles rapidly pound against the painted surface, dislodging the paint. The HEPA vacuum, which is connected to the gun head, draws paint chips and dust into the vacuum, minimizing the dispersion of the particulate.

The needle gun is appropriate for metal surfaces but may cause significant damage to masonry. Problems of worker fatigue are similar to those encountered in vacuum blasting. Losing shroud contact with the surface can cause the deposition of significant amounts of chips onto the containment surface. Chips should be cleaned up as soon as possible following the work to avoid tracking.

One way of maintaining the seal with the surface is to select the proper shroud for the shape of the surface treated. At least one manufacturer (Penntek) has developed different shrouds for corners, edges, and flat surfaces. Needle guns are not effective in capturing large paint chips, so use of plastic sheeting underneath is required.

3. Chemical Removal Methods

Chemical removal may result in less leaded dust generation than other removal methods. It is often used in situations where historic preservation requirements apply. However, it may leave leaded residues on porous surfaces, which may pose a hazard to resident children in the future.

One study has demonstrated that windows treated with chemical paint removers had high leaded-dust levels a few months after treatment, even though cleanup and clearance had

been conducted properly (Farfel, 1992).

Other drawbacks to chemical removal include high cost and potential harm to workers from splashes and chemical burns if proper gloves, face shields, and clothing are not provided and used (see Figure 12.20).

FIGURE 12.20 Workers should wear protective clothing when using chemicals.

Proper ventilation is necessary when using chemical paint removal. Plastic may not be effective in protecting floors and may have to be augmented by paper or cardboard. Chemical residues can be tracked into other areas on workers' shoes if proper decontamination is not conducted. Adjacent surfaces, especially plaster, can also be damaged. High humidity may retard the chemical remover's effectiveness. If protective clothing is penetrated and becomes matted against the skin, it must be removed *immediately*. A full shower is strongly recommended.

Off-site Paint Removal

Off-site paint removal is preferred so that most of the contamination and residues are generated away from the dwelling. The general approach is as follows.

Building components to be stripped must first be removed from the building. Misting with water prior to removal will help minimize the amount of airborne lead. The painted seam between the component and the wall should first be cut with a utility razor knife to minimize damage to the adjacent plaster. If there is more than one similar component, each component should be labeled to identify exactly where the component came from, eliminating the need for changing doors or other retrofitting problems.

Potential damage to components during stripping includes damage to hardware (this should be removed before stripping), broken glass, loss of glue joints and fillers, damage to wood fibers (wood swelling), and raising of the wood grain. The component may even fall apart and have to be blocked and re-glued. Old glazing compounds on windows may also be weakened. The stripping firm should be instructed to *thoroughly* wash and neutralize the components after stripping.

Before materials are returned from the paint stripper, they should be wrapped in heavy duty plastic and sealed with tape. This will minimize contamination of those handling the materials (leaded residue may remain on the surface). Materials should remain sealed until other on-site dust-generating activities are concluded and the dust cleaned up.

Before reinstallation, the treated components should be cleaned using the standard vacuum/wet clean/vacuum cycle to remove any residues left by the paint stripper. Components must be completely dry before repainting. Always check the pH (acidity or alkalinity) after cleaning and *before* repainting.

On-site Paint Removal

Many paint removers must be allowed to remain on the surface anywhere from 1 hour to a day or more to accomplish effective stripping.

Most paint removers are efficient within a limited temperature range and may be completely ineffective in cold weather. The contractor must therefore be certain of weather conditions before outdoor application. Also, rain or snow can cause environmental contamination from the lead and the chemical remover.

Paint removers are either caustic (corrosive) or non-caustic. The non-caustic chemical removers are generally safer to use than the caustic ones (assuming they do not contain methylene chloride). Material Safety Data Sheets should always be consulted to determine potential chemical hazards.

When using chemical strippers, securing the area where the strippers are used and the areas where they are stored is important, particularly with caustics, to prevent injuries to people who may gain access to the work area. Caustic paint removers can cause severe skin burn and eye damage to workers, other adults and children who may gain access to the work area. Pain receptors in the eyes are not as sensitive to caustic substances as they are to acids, so workers may suffer damage without immediately realizing it.

Personal protective equipment should be appropriate to the chemical paint stripping work being done; see Chapter 9, Worker Protection.

FIGURE 12.21 Eye- and body-wash stations are required when working with corrosive or irritant chemicals.

An abundant source of water within the abatement area for quick drenching or flushing injurious corrosive chemicals from skin or eyes is required by OSHA regulations (29 CFR 1910.151(c)). The water can come from a tap or portable eyewash station(s) (see Figure 12.21).

If contact with the eyes occurs, a full 15-minute rinse of the eyes is necessary on-site *before the individual leaves to seek medical attention* because permanent damage to the eyes occurs quickly. While 15 minutes may seem excessive, a quick rinse is ineffective, and permanent damage usually occurs on the way to seek medical attention.

Usually, non-caustic strippers are not as effective at removing multiple layers of paint in a single application compared to the caustic products. When using non-caustic removers, small areas should be tested before full-scale treatment to determine their efficacy. For vertical surfaces, adhesion of the liquid or gel type paint removers should also be tested to determine runoff potential (particularly a problem in warm weather). Most caustic paint removers work best on nonporous surfaces such as steel. They generally should not be used on aluminum or glass surfaces.

Paint removers that contain volatile substances should be used only in areas equipped with mechanical ventilation and only when workers are properly equipped with gloves, face shields, protective clothing, and respirators, as needed.

The paint remover should be applied with a spatula, trowel, brush, or spray gun. Spray gun use should be minimized because they increase

worker exposures. The time the remover must stay on the surface will depend upon the number of layers of paint, the type of paint, the temperature, and the humidity, and can range from a few hours to a day or more. The paint remover should not be allowed to dry out. Some manufacturers provide a polyethylene or paper blanket that is pressed into the surface to retard drying; others contain a film that is formed on the surface of the paint remover as it sits to prevent drying. Caution must be used when applying the paint remover overhead to avoid its dripping onto workers below.

After the appropriate period of time, the softened paint should be removed using a scraper or putty knife and the material deposited in a watertight and corrosion-proof container (usually supplied by the manufacturer). The waste should be managed and disposed of in accordance with the guidance in Chapter 10.

With wood surfaces, it is important to complete the entire neutralization and cleaning process without letting the surface dry. If the wood dries before cleanup is complete, the pores in the wood may close, locking potentially significant leaded residues inside. When repainting, some of the leaded residue may leach into the new paint.

Alkali neutralization and residue removal are accomplished as follows. Immediately after paint removal (while wood surfaces are still damp), the surface should be thoroughly scrubbed with a solution of glacial acetic acid. Use of vinegar to neutralize the alkali should be avoided because vinegar may be inadequate as a neutralizing agent and will also result in a significantly larger volume of liquid (and potentially hazardous) waste.

Glacial acetic acid is hazardous and can cause skin burns and eye damage. It should be used carefully and only with neoprene, nitrile, rubber, or PVC gloves; chemical-resistant clothing; eye shields; a NIOSH-approved acid gas cartridge; and a HEPA filter on air-purifying respirators.

The damp, stripped surface should be thoroughly scrubbed with the acetic acid solution. The solution should be monitored with pH litmus paper and discarded if the pH exceeds 6. After use, the solution should be placed in corrosion proof containers and treated as potentially hazardous waste. Sponges and other cleaning materials should not be reused but deposited in heavy duty (double 4-mil, or single 6-mil) trash bags that are sealed, labeled, and put in a secure waste storage area.

Following neutralization, the damp surface should be thoroughly scrubbed with a detergent and water. Scrubbing should continue until no residues are visible. The cleaning solution should be changed when it becomes dirty. Following the detergent scrub, a clean water wash should be performed to remove residue. The pH of the water wash should be checked after use. If the pH exceeds 8, further neutralization of the surface with the acetic acid solution is necessary prior to repainting since an alkaline surface will cause the new paint to fail in a matter of days or weeks.

Surfaces should be completely dry before repainting. For wood surfaces, this may take several days to a week. If the moisture has raised the grain and sanding of wood surfaces is required before repainting, a HEPA sander should be used.

Since porous surfaces such as wood or masonry may still have slight alkali residues, some types of oil paints should not be used after caustic paint remover application. To do so may result in saponification (a "soap-making" reaction between the paint and the substrate, leading to rapid

paint failure). Therefore, latex paints are probably most appropriate. Wood surfaces (especially exterior ones) can deteriorate after paint removers have been applied, making new paint difficult to apply. Also, the new paint may not last long on deteriorated substrates. Some old plasters with a high pH (that is, highly alkaline) may require primers that are no longer manufactured, so a special sealant may be needed on such surfaces. The specific paint remover manufacturer should be contacted for further guidance on appropriate paints to use.

High-pressure water removal of caustic paint removers should be avoided because control of solid and liquid contamination is difficult. Release of solids or liquids into the soil is likely to result in costly cleanup. Care must be used when applying caustic paint removers to friction surfaces, such as window jambs. Such surfaces are often weathered, making residue removal even more difficult. If these residues are embedded in a coat of new paint, the friction caused by opening and closing the windows can lead to the release of leaded-dust.

D. Waste Disposal

Wastes produced during paint removal may be highly concentrated, but low in volume. The toxic characteristic leaching procedure (TCLP) test should be used to determine if the waste is hazardous. See Chapter 10, Housing Waste, and the EPA regulations. Many local jurisdictions pick up small amounts of hazardous waste on certain days. If off-site paint removal is performed, the waste is the responsibility of the facility performing the removal.

V. Soil and Exterior Dust Abatement

A. Introduction

Lead-contaminated soil and exterior dust have been shown to cause elevations in blood-lead levels of children in a number of studies (EPA, 1993c). Exposure to lead in soil and exterior dust can occur both outside during play and inside from soil and dust carried into houses on shoes, clothing, pets, or by other means.

Soil can become contaminated over a period of years from the shedding of lead-based paint on nearby buildings, windblown leaded-dust from adjacent areas, and fallout of leaded-dust from the atmosphere (either from a local point source or from leaded gasoline emissions in the past). Uncontrolled paint removal from nearby houses or painted steel structures can also result in contaminated soil (controlling soil lead levels should be a consideration in every exterior lead-based paint abatement project).

Soil lead hazards are determined by measuring the concentration of lead in the soil, examining the location and use of the soil, and determining the degree to which the soil is "bare" (see Chapter 5). For a yard or area to require hazard control, a total of at least 9 square feet of bare soil must be present. Any size bare area in a play area containing more than 400 µg/g of lead is a hazard. Appendix 13.3 contains details on a sampling method to measure lead in soil. When assessing the condition of the surface cover, it is important to determine why the soil is bare. Bare soil is common in the following areas and circumstances:

- Heavily used play areas.
- Pathways.
- Areas shaded by trees or buildings.
- Areas with damaged grass.
- Drought conditions.

Measuring the lead content of soil will aid in the selection of an appropriate abatement method that has a reasonable likelihood of being maintained. Soil *abatement* (as opposed to interim controls) is generally appropriate when lead is present in extraordinarily high concentrations (more than 5,000 µg/g), use patterns indicate exposures are likely, or interim controls are likely to be ineffective (e.g., planting grass in high-traffic areas). Soil interim controls are covered in Chapter 11, Section VI. This section describes soil treatments that should be effective for at least 20 years.

Pre-abatement soil samples should be collected but not necessarily analyzed until post-abatement soil samples have been collected, analyzed, and compared to clearance standards. If post-abatement soil levels are below applicable limits, the pre-abatement samples need not be analyzed (see Chapter 15).

B. Soil Abatement Methods

Soil abatement methods include:

- Soil removal and replacement followed by off-site or on-site disposal; including covering with clean soil (Mielke, 2006; Mielke, 2011).
- Soil cultivation (rototilling).
- Soil treatment (e.g., organic matter, chemical, phytoremediation) and replacement.
- Paving with concrete or asphalt.

Soil removal is discussed in detail below; however, before choosing to remove contaminated soil, other treatment options should be considered. The advantages of using soil treatment methods (as opposed to soil removal) are three-fold (Elias, 1988):

- The costs of hauling large quantities of contaminated soil are eliminated or greatly reduced.
- Disposal sites for soil are not needed except for a much smaller volume of wastes generated during the treatment process.
- The need for uncontaminated replacement soil is greatly reduced.

1. Soil Removal and Replacement

For most soil removal projects, removal of 6 inches of topsoil is adequate. The depth of soil lead contamination is usually restricted to the top of the soil, with contamination decreasing markedly below the top few inches. However, in urban areas it is not uncommon for the contamination to extend to up to 1 or 2 feet in depth. This may be because these areas were once the

location of buildings contaminated with lead-based paint. Alternatively, past practices may have resulted in a gradual buildup of the elevation of the soil grade over time. In such circumstances, the removal of the top layer of soil may leave behind contaminated soil at lower depths. In mixed residential/ industrial areas, or where industry once existed, the depth of the contamination may vary widely. The desired decision on the depth of removal should also consider the depth of soil disturbance during the course of usual activities, such as gardening. If the top layer of soil will not be penetrated, then it should not be necessary to remove lead-contaminated soil at deeper levels, since there will be no exposure.

For practical purposes, properly conducted soil removal to a depth of 6 inches should suffice in urban residential areas that are restricted to grass, shrubs, or shallow gardens. However, the depth of soil contamination should be assessed at each site, and the decision regarding depth should be made based on the results of the soil sampling and anticipated use of the land. For most residential areas, the depth of removal will not exceed 6 inches (Jones, 1987; Ontario, 1987; Stokes, 1987 and 1988). Records of the soil sampling and abatement that occurs should be maintained with the permanent records of the property. These records will alert property owners who are planning excavations to depths below the abatement depth, such as for water or sewer line work, to use caution to avoid contaminating the surface soil with excavated soil. The owners should be advised to sample the soil below the abatement depth to determine the lead concentrations so that procedures can be implemented to segregate this deeper soil, if contaminated, and to use it as fill for the deeper areas of the excavation when the work is completed. With EPA's standard for the maximum allowable lead concentration in replacement soil being that it is less than 400 µg/g, the lead concentration in the replacement soil must be less than that concentration; it is advisable that, where feasible, it be half or less than that, i.e., 200 µg/g or less, to provide a precautionary safety factor.

1. **Types of Equipment** – Removal and replacement of soil in residential abatement situations may take place in both large and small sites. Some urban yards are very small, consisting of only a few square feet; others are larger, but are sometimes surrounded by buildings. Therefore, residential soil abatement will often require the use of extensive manual labor in addition to mechanical soil removal. When soil is removed by hand, it generally can be loaded into wheelbarrows and then off-loaded to other vehicles to be transported to the disposal site. Rather than off-load the wheelbarrows to dump trucks, it is usually more efficient to dump the soil directly into roll off containers, which are then loaded onto trucks for transport to the disposal site.

2. **Sod and Seeded Grass Maintenance** – All grass sod planted as part of the abatement process should be maintained until the end of the growing season. This maintenance should include initial frequent watering to establish the rooting of the sod and germination of the grass seed, followed by watering on a regular basis to keep the grass in a healthy state. Under some conditions, seeding the soil may be practical, but often it is not realistic to restrict use of the soil area for the length of time needed to establish newly seeded grass.

3. **Identify Utilities** – The owner or contractor should contact the local coordinated information source for all utilities before beginning work to obtain exact locations of all underground utility lines. If a utilities information service does not exist in the community, the individual utilities should be contacted directly. In addition, the Common Ground Alliance's (CGA's) One Call Systems International committee maintains an 811 telephone number which will notify local utility companies about the intent to dig so that, within a few days, they can "send a locator

to mark the approximate location of your underground lines, pipes and cables, so you'll know what's below – and be able to dig safely" (***http://www.call811.com/how-811-works/default.aspx***). CGA also maintains an on-line interactive map (***http://www.cga-onecall.com/map/***) and a state-by-state listing (***http://www.call811.com/state-specific.aspx***) of contact information for "one call" centers for each U.S. state and Canadian province that should be able to help with finding underground service lines.

4. **Protect Utilities** – Care should be taken to protect existing utilities during abatement to prevent any damage to existing underground and overhead utilities and to prevent any harm to human life and property. If a contractor is used, the owner should require the contractor to protect the existing utilities and to make good any damage to these utilities as quickly as possible.

5. **Existing Fences** – Care should be taken while removing existing fencing for worksite access. Such fencing should be salvaged and reinstalled (if it does not contain lead-based paint) to the satisfaction of the owner. In some cases, fencing may have to be replaced.

6. **Protection of Adjacent Areas** – When working adjacent to excluded areas, including sidewalks, fences, trees, and patios, the soil should be excavated at a slope away from the excluded areas of less than 2 percent so that contamination does not wash or roll into the excluded area.

7. **Inclement Weather** – Removal and/or replacement operations should be suspended at any time when satisfactory control of the overall operation cannot be maintained on account of rain, wind, or other unsatisfactory weather or ground conditions. Determination of such conditions should be made by the owner or project consultant. When such conditions exist, the work area should be cleaned up immediately and work suspended. High winds can disperse contaminated soil and dust to off-site areas and runoff from rain can carry contamination outside the abatement area.

8. **Vehicle Operation** – Prior to hauling contaminated soil, a vehicle operation plan should be prepared for the equipment and hauling vehicle operators, which includes but is not limited to information on the cleaning of vehicles, securing of tarps and tailgates, ticketing of trucks, unloading of material, and handling of spilled soil.

   All trucks, hauling vehicles, and containers loaded with contaminated soil should be inspected for loose material adhering to the outside of the body, chassis, or tires before departure from the worksite. Such material should be cleaned up before the vehicle leaves for the disposal site. If the truck tires made contact with the contaminated soil, they should be cleaned before the trucks leave the work area. The tires should be brushed off on a plastic sheet and the contaminated soil loaded onto the truck or returned to the lot being excavated.

   Soil should be loaded directly into dump trucks or disposal containers from the worksite. If possible, there should be no "double- handling" of contaminated material, such as shoveling the soil into a wheelbarrow, moving it to another location, dumping it, and shoveling it again into another container. This double handling not only wastes time but also increases the likelihood of spreading the contamination and tends to make site cleanup more difficult. The trucks should have secure fitting tarps and sealed tailgates to reduce leakage as much as possible.

FIGURE 12.22 Replacing resident pathway after soil removal.

9. **Soil Replacement and Cleanup** – Prior to soil replacement, all walks, driveways, lanes, and streets adjacent to the excavation area should be cleaned of all contaminated soil (see Figure 12.22). All loose soil should be scraped, washed, and swept from the above-mentioned surfaces. No clean soil should be placed down until all contamination has been removed from these areas.

   At the completion of the workday, all loose contaminated soil within the limits of the work area should be collected. The collected soil should be transferred to a dump truck or other container for subsequent disposal.

   All hard surfaces, such as sidewalks, paved driveways, and patios, should be cleaned at the completion of each workday. This daily cleanup should consist of scraping, washing, vacuuming, and wet sweeping all soil from the above-mentioned surfaces.

   Cleanup procedures should begin early enough so that they can be completed before the end of the workday.

10. **Prevention of Contamination from Underlying Soil** – Regardless of the depth of removal, the possibility of contamination of the replacement soil from the underlying unexcavated soil exists, particularly from future activities. One way to minimize this occurrence is by laying a water-permeable fabric (geotextile) or similar lining at the bottom of the excavated areas to provide a visual demarcation between replaced soil and original soil (Weitzman, 1993). This liner can serve as a warning for persons digging in the future to exercise caution so that contaminated soil beneath the liner does not become mixed with the replacement soil.

11. **Contaminated Soil Load Manifest System –** In order to keep track of the contaminated soil being hauled away from the site, a load manifest system should be used to keep an exact record of the time and location of disposal. The manifest should consist of a two-part ticket, with one ticket given to the owner at the time of truck departure and the other held by the hauler. The disposal site ticket should be presented to the site owner or inspector technician before the end of the workday on which the material was deposited in the dump site. The purpose of the manifest system is to ensure that the contaminated soil is not used as fill in other residential areas. Soil waste should be managed and disposed of carefully; it may be considered hazardous as a result of a TCLP test (see Chapter 10, Housing Waste).

12. **Final Grade** – The final grades of replaced soil should be 2 inches above existing grades to allow for settling and to ensure that all drainage is away from existing structures.

13. **Existing Vegetation** – A number of precautions are needed to protect existing vegetation, such as bushes and trees. It is advisable to tie trees and shrubs to ensure stability. Hand tools are needed to scrape soil from around roots without undermining or damaging them. Any large roots should be left undisturbed.

14. **Tool Contamination** – To minimize the cross-contamination between excavation and

replacement worksites, separate tools should be provided for the excavation and replacement activities. A less-expensive alternative is to employ an acceptable method for decontamination of tools, workers' clothing, and footwear. The decontamination should include physically removing as much soil as possible and then washing and rinsing the contaminated items with water.

All workers should clean their boots thoroughly before leaving the work area. The soil removed from boots should be disposed of either in a truck used for hauling contaminated soil or left in the worksite.

15. **Prevention of Off-site Movement of Contaminated Soil** – Contaminated soil should be removed from the site as soon as possible to prevent wind and water erosion. To prevent off-site migration and to avoid the possibility of tampering by children, piles of contaminated soil should not be left on-site overnight. Wind erosion can occur on any site. Water erosion is more likely on hilly sites or during heavy precipitation. Exposed sites can be covered with plastic and secured in place to prevent off-site migration of contaminated soil. An alternative method is to wet down the site at the end of the workday to prevent wind erosion. Similar problems will be encountered when contaminated soil is stockpiled during the day prior to disposal at the end of the day. In this case, wind and water erosion should be controlled by using a combination of plastic sheeting and silt fencing.

16. **Site Control** – The following precautions should be taken:

- To prevent the spread of contaminated soil, secure working limits should be defined for each area of excavation. Access to this area should be restricted to authorized personnel with entrances and exits controlled.
- The abatement work area should be enclosed with temporary fencing or adequate barricades to prevent unauthorized personnel or animals from entering the work area.
- Yellow caution tape should be installed across doors leading to abatement areas.
- Access routes to homes should be maintained at all times. Such routes should not require passing through the area of excavation.
- The removal of a partial grass cover in preparation for the laying of sod or grass seeding may *temporarily* increase the amount of bare contaminated soil. On-site exposure could result when children play on the exposed soil. Abatement workers can control this during the day by means of adequate site control. However, control is difficult, if not impossible, after the end of the workday. Lead hazard warning signs should be posted to warn residents.
- In order to minimize inconvenience to residents and neighbors and to minimize exposure, abatement of a particular site should be completed within 1 workday.

2. Soil Cultivation

Soil lead concentration often decreases with increasing depth, so soil mixing can be considered to be an abatement strategy. If the average lead concentration of the soil to be abated is below 1,200 µg/g, thorough mixing is an adequate abatement method. Pilot testing may be necessary to determine the type of mixing process needed. Rototilling may not be effective.

FIGURE 12.23 Preparing to pave high traffic area.

3. Paving

If contaminated soil is present in high-traffic areas, the soil can be covered by a high-quality concrete or asphalt (see Figure 12.23). In this case, contaminated soil need not be removed before paving. Normal precautions associated with thermal expansion or contraction and traffic load should be considered. Hard surfaces are not appropriate in play areas where falls are possible from slides, jungle gyms, etc. The Consumer Product Safety Commission has developed recommendations for fall surfaces in public play areas (e.g., addressing the need for impact attenuating protective surfacing under and around equipment, installation and maintenance procedures, and general hazards presented by protrusions, etc. CPSC, 2008; ***www.cpsc.gov/CPSCPUB/PUBS/325.pdf***).

4. Other Soil Treatment Methods Under Study

HUD has funded studies to investigate other potential methods to reduce soil lead hazards. Plants can reduce the soil lead level (phytoremediation) but their use has not been widely tested or applied. The use of chemical additives (e.g. phosphate) to reduce the biological availability of lead appears to be attractive, but studies are continuing.

C. Exterior Dust Control

Lead in exterior dust can be a source of exposure to children because it can be tracked inside and carried on the skin, especially the hands (Bornschein, 1986). For example, in older urban areas in Cincinnati, exterior leaded-dust concentrations are on average about four times higher than interior leaded-dust concentrations, and exterior lead surface loadings are much higher than for interior dust (Clark, 1993). Just as children can be directly exposed to leaded-soil, they can also be exposed to exterior leaded-dust. Exterior dust can also migrate by various means (children, adults, pets, or wind) to the interior of homes where there are many opportunities for exposure to children. Exterior leaded-dust concentrations up to 50,000 µg/g (equivalent to 5 percent lead in dust) have been measured in urban areas in the EPA Soil Lead Abatement Demonstration Project (EPA, 1993c).

If only an individual property is involved in the exterior dust-control activity, the type of equipment that can be used will be limited by the size of the area involved and the person responsible for the area. Owners are not required to clean streets, for example. Because of the mobility of exterior dust, the length of time that the dust cleanup remains effective will be limited by the size of the abatement area and therefore may need to be repeated periodically.

Exterior dust control consists of two components:

- Controlling sources of lead-contaminated dust.
- Removing lead-contaminated dust from paved areas.

Without adequate control of the sources of lead in exterior dust, recontamination of the exterior areas will occur. Studies of a schoolyard area indicated that leaded-dust concentrations equaled pre-abatement levels within 1 year in Winnipeg, Ontario (Stokes, 1988). Recontamination of some paved areas in Cincinnati occurred within a few days (Clark, 1991), indicating that repeated cleaning and control of the *sources* of the lead are necessary.

1. Types of Equipment

Exterior dust cleanup consists of removing as much dust and dirt as possible from all paved surfaces on the property or properties involved. Lead-contaminated dust can be found on paved surfaces such as sidewalks, patios, driveways, and parking areas. For multiple adjacent proper ties that are being abated, cleanup of streets, alleys, or other common areas should be considered, although this is normally a municipal responsibility. Brick paved areas present the biggest challenge in removing exterior dust because they contain numerous cracks. For individual properties, hosing off walkways and play areas periodically may reduce exterior leaded-dust levels.

In order to meet this cleaning challenge, it is necessary to have available the most efficient hard-surface vacuum cleaning equipment. Many commercial contract cleaning firms located in urban areas have such equipment.

There are several different types of suitable paved-surface cleaning machines:

- Hand-pushed vacuum cleaners.
- Vacuum-assisted sweepers, which are similar to the traditional broom sweeper, with the added feature of a slight vacuum that assists in controlling dust and transporting material from the broom bristles to the hopper.
- Vacuum sweepers, which lift material from paved surfaces – some are equipped with curb brushes to assist in transporting the material from the edge of the cleaning area to the vacuum head and into the hopper.
- Trucks equipped with strong vacuums and large HEPA filters for the exhaust.

EPA research has found that regenerative air machines, which depend on rapidly moving air to capture particles from the surface of the pavement, frequently remove only a small fraction of the dust and thus may not be suitable for lead abatement work (Pitt, 1985).

2. Evaluation of Equipment

A number of pavement-cleaning machines were tested as part of the Cincinnati Soil Lead Abatement Demonstration Project (Clark, 1993). The machines tested were the vacuum-assisted sweeper, the vacuum sweeper, and the regenerative air machine. Initial tests demonstrated that several machines operated above the 90 percent efficiency level. A machine performing at the 90 percent efficiency level will pick up 90 percent of the available dirt after two passes. Equipment tested involved both large machines suitable for streets and parking lots and some walk-behind, vacuum-assisted broom sweepers suitable for sidewalks and other smaller areas. Several larger machines performed at or above the 90 percent efficiency rate. Some of the smaller walk behind sweepers did not perform at an acceptable level of efficiency.

Care must be taken when emptying the collected dust from the machines. The most appropriate method to minimize dust release is to dampen the contents of the hopper using an accessible hose. If water is to be used for dust control, it will be necessary to devise a means of containing excess water. This can be achieved by placing 6-mil polyethylene plastic on the ground where the equipment is being emptied and carefully collecting the water after the hopper has been emptied. It is also necessary to perform this activity in a secure area so that children are not exposed.

3. Removal of Heavy Accumulation

The first step in cleaning an area should be the removal of heavy accumulations of dust and debris. The heavily accumulated areas can be cleaned either by manually removing the material with scrapers, shovels, or brooms, or by vacuuming the heavily accumulated areas if vacuuming proves to be adequate in removing the contamination. Just as in handling lead-contaminated soil, the heavy accumulations of exterior dust should be dampened.

4. Vacuum Cleaning

Small areas, such as sidewalks and patios that are inaccessible to larger cleaning machines, may be cleaned with an acceptable vacuum cleaner (see Chapter 14 for discussion of vacuum cleaners). Surfaces should be vacuumed continuously until no additional visible dust is being removed by further vacuuming.

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How to Do It

1. **Include cleaning in plans for the work.** Include written step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in the project design or specifications, using information contained in this chapter. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment. Have sufficient cleaning equipment and supplies *before* beginning work, including:

   - Detergent
   - Waterproof gloves
   - Disposable rags
   - Mops
   - Buckets
   - Vacuum (preferably HEPA-equipped) with attachments (crevice tools, beater bar for cleaning rugs, etc.)
   - Plastic bags for disposal of debris and heavy duty protective sheeting (of sufficient thickness to prevent puncture)
   - Debris containers (heavy duty plastic bags are adequate for most jobs)
   - Containers for dirty wash water
   - Shovels
   - Rakes
   - Water-misting sprayers
   - Heavy duty polyethylene sheeting (or equivalent) of sufficient thickness to prevent puncture (e.g., 6 mil).

2. **Restrict access to work area.** Do not allow residents to enter the work area until cleaning is completed and clearance is established.

3. **Clean before starting work.** If contamination is extensive, conduct precleaning of the dwelling unit and furnishings, if needed, before beginning paint-disturbing work. Move and/or cover all furniture and other objects.

4. **Conduct ongoing cleaning during the work.** Conduct ongoing, continual cleaning during high-dust jobs, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before such items are removed from containment areas. Electrical equipment should be wiped and vacuumed, not wetted down, to minimize electrocution hazards.

5. **Clean at the end of each work day.** For high-dust jobs, schedule sufficient time (usually 30 minutes to one hour) for a complete daily cleaning, starting at the same time near the end of each work day after paint-disturbing activity has ceased.

6. **Wait one hour before final cleaning.** For final cleaning, wait at least 1 hour after active paint-disturbing activity and other dust-generating work has ceased to let dust particles settle.

7. **Clean and remove protective sheeting used for dust containment.**

8. **Use both vacuuming and wet cleaning.** Clean all surfaces, using the two basic cleaning methods, vacuuming and/or wet cleaning. Cleaning procedures may vary, depending on the amount of dust generated by the job and the smoothness of the surfaces to be cleaned. A three-phase, vacuum-wet cleaning-vacuum cycle is recommended for high-dust jobs with some rough or porous surfaces. For low-dust jobs with all smooth surfaces, wet cleaning may be adequate to pass clearance. Surfaces that are badly soiled often require extra manual effort, involving hand wiping until no more visible dirt comes up. Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.

9. **A HEPA vacuum is required if a vacuum is used**.

10. **Follow the cleaning sequence, "ceiling to floor and out the door."** For high-dust jobs, vacuum all surfaces in the room (ceilings, walls, trim, interior window sills, window troughs, hard surface floors, and other horizontal surfaces). Start with the ceiling and work down, moving toward the entry door ("ceiling to floor and out the door"). Completely clean each room before moving on. For low-dust jobs, it is not necessary to clean ceilings and walls, except that they should be cleaned if they were the surfaces on which the work was done. See Chapter 8 for a description of low-dust and high-dust jobs.

11. **Use a common detergent, not TSP (Trisodium Phosphate).** Use a standard household detergent, not a high-phosphate detergent, to dislodge any ground-in contamination. Use either the three-bucket system described in this chapter, or a use-once-and-toss system, as also described below. If buckets are used.

12. **Inspect visually.** After final cleaning, the supervisor should perform a visual inspection to ensure that all visible dust and debris has been removed. Reclean if necessary.

13. **Paint and/or seal, if necessary.** Paint or otherwise seal treated surfaces and interior floors, if necessary.

14. **Final wet cleaning.** After painting that has followed high-dust jobs, conduct a final wet cleaning of horizontal surfaces.

15. **Clearance.** Workers should stay out of cleaned rooms until after the clearance examination. Conduct a clearance examination (see Chapter 15). (Clearance, while recommended by HUD, is not required by regulations in certain circumstances, such as for *de minimis* projects under HUD's Lead Safe Housing Rule or under the EPA's Renovation, Repair, and Painting Rule., which requires cleaning verification for most projects; see Chapter 11.)

16. **Repeat cleaning and clearance (or cleaning verification), if necessary. Continue clearance testing (or cleaning verification) until the dwelling unit or work area passes.** If the unit fails, repeat cleaning of all of the surfaces that failed and all other surfaces represented by the surfaces that failed.

    - ✦ As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to pass clearance or cleaning verification should be borne by the contractor, not the owner, as a matter of the job specification.

I. Introduction

This chapter describes cleaning procedures to be employed before, during and following lead-based paint abatement, interim controls and other renovation or maintenance work that may create lead-contaminated dust. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities and many other paint-disturbing jobs can produce dangerous quantities of lead-contaminated dust. Unless this dust is properly removed, a dwelling unit may be more hazardous after the work is completed than it was originally. Whenever possible, ongoing and daily cleaning of settled dust during lead hazard control and renovation projects is recommended. Ongoing and daily cleaning are also necessary to minimize worker exposures by removing excess dust from the work area.

Cleaning is the process of removing visible dust and debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded-dust are also removed. This is true regardless of whether the dust was present before the work or generated by the work itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

The cleaning methods and procedures described in this chapter are for hard surfaces. Workers should not attempt to clean carpets or rugs following lead hazard control or other paint disturbing work unless they know that the carpets are new and therefore are not likely to contain lead-contaminated dust embedded in the fibers and backing, or unless the workers are prepared to spend hours vacuuming the carpeting over and over again until the deeply embedded dust is removed. Vacuuming an old carpet may bring some of the embedded dust to the surface of the carpet, increasing the dust-lead loading levels on the surface and thus increasing the likelihood that children will be exposed to lead in the dust and that the carpet will *not* pass clearance (Ewers, 1994). Therefore it is better to clean and carefully remove the protective sheeting that is over the carpet (as described later in this chapter), and then have clearance dust-wipe sampling performed on the carpet. If lead levels on the surface of the carpet are found to exceed the clearance standard (which is the same as the hazard standard in EPA regulations), it will be necessary to either thoroughly clean the carpet or dispose of it. See Section V.B.2 of Chapter 11 for guidance on dust removal from carpets.

A. Performance Standard

The cleaning methods described in this chapter are designed to achieve clearance. (The clearance examination, which includes a visual assessment and dust sampling, is described in Chapter 15.) Although these cleaning methods are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

According to EPA (40 CFR 745.227(d)(8)(viii)) and the HUD regulations (24 CFR 35.1320(b)(2)(i)) that follow the EPA regulations, the permissible amount of lead in dust remaining on each of the following surfaces following lead hazard control work – the clearance standards – must be less than the following levels:

- 40 µg/ft² on floors (both hard-surfaced and carpeted),
- 250 µg/ft² on interior window sills (stools), and

- 400 µg/ft² on window troughs (the area where the sash sits when closed, plus the area of the exterior sill between the sash and the frame for the screen and/or storm window, if present).

These levels are based on wipe sampling. They apply to single-surface wipe samples and to composite wipe samples with only two subsamples. To evaluate the results of a composite sample with more than two subsamples, the standards listed above must be divided by one-half the number of subsamples. (Note that these *Guidelines* do not recommend the use of composite wipe sampling; see Chapter 15.)

If state, local or tribal standards are more stringent, they apply. Note that EPA and HUD require clearance of window troughs for abatement and for other lead hazard control work covered by HUD's Lead Safe Housing Rule above *de minimis* amounts. A clearance examination includes wipe sampling of window troughs as well as interior window sills and floors.

Clearance is not easily attained. Over 20 percent of the dwellings enrolled in the evaluation of the HUD Lead Hazard Control Grant Program failed to pass clearance on the first try, and the clearance levels applicable at the time of the study were at least twice as high as those listed above and thus less difficult to achieve (NCHH, 2004).

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain unacceptably high levels of lead in dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

Although cleaning is an integral and essential component of any lead hazard control activity, it is also the part of the activity that when conducted improperly is most likely to cause clearance failure. Common causes for this failure include worker inexperience, high dust-producing methods, rough surfaces, and tight deadlines.

1. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards, workers often require a significant reorientation to cleaning. Many construction and maintenance workers are used to cleaning only dust that they can see, not the invisible dust particles that are also important to remove.

Any worker performing cleaning for either clearance or cleaning verification needs training and hands-on practice in the stringent levels of cleaning required to pass clearance or cleaning verification.

Many of the cleaning methods described in this chapter are not standard, traditional procedures for general home improvement contractors and maintenance crews. Therefore, owners and managers must ensure that contractors and crews follow the specialized cleaning procedures recommended herein or specially designed alternative procedures, even though some steps may appear to be redundant or unnecessary. These methods have been shown to be feasible and effective in many situations, and skipping steps in the cleaning procedures may increase the possibility of failing clearance and harming children.

2. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods during the hazard control or renovation work, inadequate dust containment, and poor work practices can all make achievement of clearance particularly difficult. Dust generated by the work should be contained, to the extent possible, to the inside of work areas. Floors and any furnishings left in the work area should be carefully covered with impermeable protective sheeting. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has blown out or been tracked out of the work area. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential. See Chapter 8 for guidance on worksite preparation and other work practices.

3. Rough Surfaces

It is often difficult to dislodge dust in the crevices of rough, pitted or cracked surfaces, yet small amounts of dust in such locations can be picked up in clearance wipe samples and cause clearance failure. Making surfaces smooth and cleanable increases the likelihood of achieving clearance.

4. Rushing to Meet Tight Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and careless work practices, including rushed clean-ups.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control or renovation activity.

- ✦ Is the critical importance of cleaning understood by the project supervisor / certified renovator / abatement supervisor, and all workers on the job?
- ✦ Have all workers been trained for hazard control work or lead-safe work practices?
- ✦ Have all workers carefully studied the step-by-step procedures for precleaning before the work begins (if needed), in-progress cleaning, and daily and final cleanings?
- ✦ Have the before-work, daily, and final cleanings been scheduled properly and coordinated with the other participants in the project?
- ✦ Have cleaning equipment, materials and supplies been obtained?
- ✦ Do the workers know how to operate and maintain special cleaning equipment, do they have directions for the proper use of all cleaning materials, and are they receiving adequate supervision of their cleaning activities?

- Are all workers properly protected during the cleaning processes (see Chapter 9)?
- Have provisions been made to properly handle and dispose of waste (see Chapter 10)?
- Have visual inspections and clearance testing (or cleaning verification) been arranged (see Chapter 15)?
- Are the clearance (or cleaning verification) criteria to be met fully understood?
- Have all appropriate surfaces been properly painted or otherwise sealed?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: a high-efficiency particulate air (HEPA) filter vacuum cleaner, and attachments (crevice tools, beater bar or agitator head for cleaning carpets and rugs, etc.) (see Figure 14.1); detergent; waterproof gloves; rags, mops, and buckets; heavy-duty plastic bags (preferably 6-mil) for debris; waste water containers; shovels (and rakes, if needed) for debris removal; water-misting sprayers; and disposable, impermeable protective sheeting, such as polyethylene plastic sheeting of a thickness to prevent puncture (e.g., 6-mil).

FIGURE 14.1 There are many brands of HEPA vacuums on the market.

C. Waste Handling and Disposal

Generally, dirty water used in cleaning should be disposed of down a toilet. Do not pour dirty water onto the ground or down a storm sewer. Vacuum and/or wet clean protective sheeting. Vacuum contaminated disposable clothing. Wrap or bag (with heavy-duty plastic) disposable clothing and protective sheeting, architectural debris, paint strippings, paint chips and dust, vacuumed debris and vacuum filters, rags, and other material. Seal the packages with tape and store them temporarily in a secure location (such as a locked large metal bin for refuse, e.g., a Dumpster®). Dispose of the waste in an appropriate State-permitted solid waste facility, unless the waste is exempt from that requirement. See the next paragraph and Chapter 10 for further information on waste disposal.

EPA has stated that waste generated by lead-based paint activities in housing falls under the household waste exemption in the Resource Conservation and Recovery Act (RCRA) (EPA, 2000b). The household waste exemption applies to waste generated by contractors as well as to waste generated by residents, and it applies to all lead-based paint activities, including abatement, interim control, and renovation and remodeling of housing. Types of housing included in the household waste exemption are single-family homes, apartment buildings, public housing, and military barracks. HUD and EPA both recommend that the lead-safe practices described above and in Chapter 10 be followed to reduce the likelihood that household waste will contaminate the environment.

States and local governments may institute hazardous waste requirements applicable to lead activities in housing. Owners and contractors should determine what, if any, state or local regulations apply, and should comply with them.

III. Cleaning Methods

Two basic cleaning methods have proven effective, especially when used concurrently: (1) vacuuming, using a high-quality vacuum cleaner equipped with a HEPA exhaust filter, and (2) wet cleaning with a household detergent and rinsing. Trisodium phosphate (TSP) is not recommended, as explained below in Section III.D. A proven cleaning procedure is a three-pass system, in which the surface is first vacuumed to remove as much dust and small debris as possible, then wet-cleaned to dislodge fine dust, and finally vacuumed again to remove any remaining particles. However, it may not be necessary to use all three steps on all surfaces. As explained in Section V below, research indicates that the way these methods should be used depends on whether the work was a high-dust or low-dust job and whether the surfaces being cleaned are smooth or rough (Dixon, 2004; California Dept. of Health Services, 2004).

A. Vacuums: HEPA vs. non-HEPA

If a vacuum cleaner is used during lead hazard control projects, renovation projects, or other work covered by OSHA regulations, the vacuums must be a HEPA vacuum. This section provides technical information on the various types of vacuum cleaners.

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters. (Note that, when HEPA vacuums are specified by regulations or specifications, ULPA filter vacuums may be used because of their grater dust collection efficiency.)

Experts have recommended using HEPA vacuums to cleanup leaded-dust because conventional vacuums, without the high efficiency filter, may send very fine lead-dust particles out the exhaust and back into the indoor environment. One study in 1992 supported this view (CMHC, 1992). More recent studies, however, have found that the difference in collection efficiency between HEPA and non-HEPA vacuums is not significant (California Department of Health Services, 2004; Rich, 2002; and Yiin, 2002).

There is more to a vacuum than the filter. Other important factors that determine the effectiveness of a vacuum are particle lifting velocity (which is a function of the motor, the design of the suction tool, and the extent to which the rest of the system does not release air before it is supposed to), quality of construction (which may determine the durability of the machine and whether there are air pressure leaks before the filtration), and whether the vacuum has special tools, such as a crevice tool (see Figure 14.1). These *Guidelines* recommend that a high-quality HEPA vacuum be used if possible; however, a high-quality household or commercial vacuum should be used if a HEPA vacuum is not available. The California study cited in the previous paragraph found that a HEPA vacuum was actually less effective in removing dust-lead from vinyl floors than non-HEPA vacuums, probably because the suction tool was not well designed for the job. Also, filters are available that, while not HEPA, are better than those that formerly were standard on household and commercial vacuums. One additional benefit of a HEPA filter is that it may catch other contaminants in the residential environment, such as allergens, in addition to very fine lead particles.

B. HEPA Vacuums

This section provides background information on HEPA vacuums.

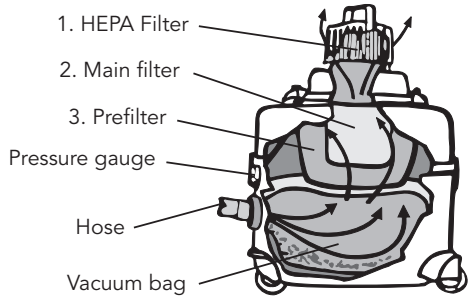
Operating Instructions

There are numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces (such as brushes of various sizes, crevice tools, angular tools, etc.), as is true with conventional vacuums (see Figure 14.2).

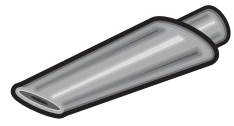


Parts of a HEPA-vacuum
Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Use special attachments
Use the rubber cone where the floor meets the baseboards and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead-dust.


Rubber Cone


Dust Brush


Powered Carpet Beater

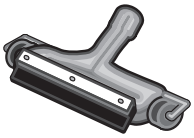

Wheeled Floor Nozzle

FIGURE 14.2 Vacuum with a HEPA filter and special attachments.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunch bucket-sized unit, which may be carried like a backpack, up to truck-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed (see Figure 14.3).

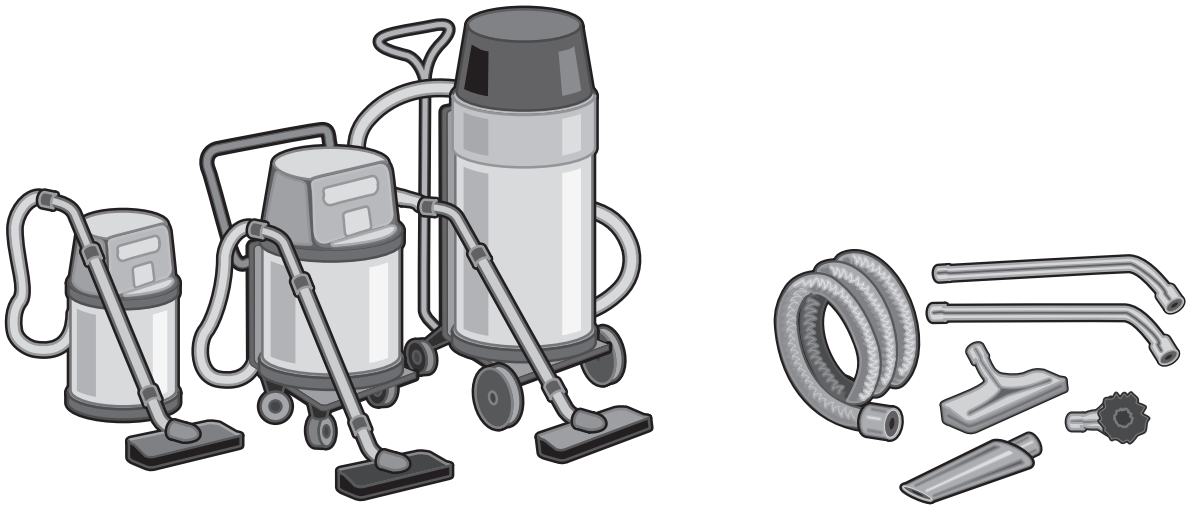


FIGURE 14.3 Sizes of HEPA vacuums and attachments.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust air stream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

Wet-Dry HEPA Vacuums

Wet-dry HEPA vacuums are equipped with a special shut-off float switch to protect the electrical motor and the HEPA filter from water contact. Some hazard control contractors have found these vacuums to be particularly effective in meeting clearance standards and in avoiding damage to vacuum equipment.

C. Emptying the Vacuum

Used filters and vacuumed debris should be handled and disposed of in accordance with guidance provided in Chapter 10. Emptying should be done in the containment area or in a secure

and controlled space off-site (such as at the contractor's facility). The vacuum should be placed on a large sheet of plastic to contain dust and debris released during the opening, emptying and replacement steps. Vacuum users should use extreme caution when opening the vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed. Operators should wear protective clothing and appropriate respiratory protection when performing this maintenance function

D. Wet Cleaning

It is recommended that a general all-purpose household cleaner be used for wet cleaning. Cleaners made specifically for lead may also be useful, although one study found that lead specific cleaners performed no better than all-purpose household cleaners, and that no published studies have shown lead-specific cleaners to be more effective than all-purpose cleaners (Lewis, 2006). Cleaning with water alone can also be effective, but detergents and lead-specific cleaners are recommended because they probably keep dust and soil in suspension better than plain water (EPA, 1997a; EPA, 1998). HUD does not recommend trisodium phosphate (TSP). Not only has TSP been banned in some areas because of negative effects on the ecology of aquatic systems, but research indicates that phosphate content is not associated with effectiveness in removing lead-contaminated dust from residential surfaces (EPA, 1997a; EPA, 1998, Lewis, 2006).

Research also indicates that the effort put into the cleaning, i.e., the amount of pressure applied to the surface and the thoroughness of the cleaning, may be more important than the choice of cleaning agent (EPA, 1997a). Note that whenever a wet cleaner is used, a small area of the surface should be tested to make sure that it does not damage the surface or its coloring. If so, another wet cleaner should be used.

Proper procedures for using detergents include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops (including several clean mop heads), brushes, and rags. Follow manufacturer's instructions for the equipment used. Using the proper equipment on each surface is essential to the quality of the wet wash process.

Wet Cleaning Procedures

Some wallpaper surfaces may be damaged by wet washing with detergents. Test a small area first. If it appears that damage will occur, try another detergent, use plain water, or as a last resort clean by repeated vacuuming only.

Use of string mops is recommended for floors. Sponge mops may only push the lead around on the floor, not pick it up. A three-bucket system is recommended with mops (see Figure 14.4). The first bucket contains the cleaning solution, the second includes a mop squeezer, and the third

FIGURE 14.4 Three-bucket cleaning system.

FIGURE 14.5 HEPA vacuum and wet wash technology.

contains rinse water. Use a clean mop head for rinsing. Three-bucket system is also discussed below under Section V.E, Final Cleaning.

Some experienced contractors have used, instead of the three-bucket mopping system, a "wet, wipe and toss" procedure. This method requires a large quantity of clean rags, which are put into a bucket of detergent and water solution to *wet* them. The worker pulls a rag from the bucket, wrings it out over the bucket, *wipes* clean an area of about 16 sq. ft., *tosses* the used rag away, pulls another rag, and so on. If the detergent requires rinsing, repeat with clean water. For sills, troughs, counters, shelves, walls and tight floor spaces like behind toilets, the wet wipe and toss method is the best alternative to the mop. Some contractors prefer the method even for large floor areas. A major advantage is that it avoids the potential problem of recontaminating the area by cleaning with dirty water. This method may also use less water than a mop, which can be an advantage for some household areas. The rags are commercially available, disposable cloth scraps or paper products. Cloth rags usually are not cleaned and reused because of the risk of contaminating other laundry (White, 2003). Alternatively, some people use wet-dry HEPA vacuums (see Figure 14.5).

Changing the Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface area limits. (Note that this issue is largely avoided if the "wet, wipe and toss" method is used, because each rag is used only once.) However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no more than 1000 square feet. Dirty cleaning mixture should be handled and disposed of in accordance with guidance provided in Chapter 10. Wash water should never be poured onto the ground. It is sometimes filtered, and usually poured down a toilet.

IV. Cleaning Procedures Before and During the Work

The special cleaning procedures to be followed *before and during* a hazard control or renovation project are discussed in chronological order below. Skipping steps in the process may result in failure to meet clearance standards.

A. Cleaning Before Work Begins

Precleaning (i.e., cleaning conducted before lead hazard control or other paint-disturbing work is begun) is necessary only in dwelling units or common areas that are heavily contaminated with lead in dust and paint chips. Precleaning involves the removal of debris and paint chips, followed by vacuuming (see Figure 14.4). These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the worksite preparation being used (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area and/or covered with protective sheeting prior to beginning the precleaning procedure. Carpeting (including rugs) should always be misted before removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared, with necessary boxes, packing materials, and staff, to complete this activity before lead hazard control work begins. As a last resort, the contractor or the maintenance staff may pack any remaining belongings and carefully seal and move the boxes from the work area.

Once the residents' possessions that can be removed from the work area have been removed, the contractor shall ensure that the residents leave the work area and do not return until after clearance (or cleaning verification) has been passed.

Clearance should be conducted after final cleaning but *before* resident's items are moved back in. (See Chapter 15.) Following cleaning and clearance, the contractor should return all resident-owned items to their appropriate places. Leaving these tasks to the contractor or the management may be expensive and inefficient, since the contractor will need to be insured against the possibility that the occupant's belongings may be damaged.

B. Ongoing Cleaning During the Job

On all jobs, it is good practice to regularly clean the work area and the travel pathways used by workers, by removing debris and vacuuming dust during the work shift, in order to keep the areas free of excessive accumulations of dust and/or debris.

For high-dust jobs, when a large amount of paint chips or dust is being generated, continual debris removal and vacuuming of dust during the work day may be necessary to minimize worker exposure and tracking of dust and paint chips from one area to another. Extra attention should be paid to ongoing cleaning so that daily clean-up goes quickly.

Research conducted shortly before the publication of this edition of these *Guidelines* on whether if differences exist between two new and two older methods for removal of lead-contaminated dust from three wood surfaces of varying roughness or texture found that the reduction in lead dust achieved by vacuuming and wet wiping, the traditional method, was somewhat greater and more consistent than the electrostatic dry cloth and wet Swiffer-brand mop, a newer method. (Lewis, 2012) As noted in that paper, the wipe product industry continues to develop products; future cloths may have higher dust reduction efficiencies.

C. Daily Cleaning

Cleaning activity should be scheduled at the end of each work day when all active work has ceased, whether or not this is a regulatory requirement for the particular job. Sufficient time should be allowed for a thorough and complete cleaning, usually about 30 minutes to an hour, less if cleaning has been done throughout the work shift. (If work is being done in multiple shifts, it is recommended

that there be a cleanup at the end of each shift.) Daily cleaning helps achieve clearance dust-lead levels by minimizing problems that may otherwise occur during final cleaning, and it limits worker exposures. Daily cleaning can be skipped within vacant buildings. Daily cleaning is essential when occupants will return in the evening to occupy spaces outside the containment area. Under no circumstances should dust or debris from the project, or protective sheeting be left outside overnight, even if the dwelling is vacant. (Storing bagged dust and debris from the project, and protective sheeting in secure containers outside is permissible.) Daily cleaning should consist of:

- Wrapping or bagging dust and debris from the project, and storing it in a secure area
- Vacuuming protective sheeting on floors and furnishings
- Vacuuming other horizontal surfaces
- Vacuuming and wet cleaning floors of hallways and rooms used as pathways by workers to travel outside the work area, if such spaces are accessible to residents during non-work hours
- Cleanup of exterior debris and paint chips, and removal of exterior protective sheeting
- Patching and repairing protective sheeting
- Putting any protective sheeting that is removed in a secure place

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in heavy duty (6-mil plastic or similar sheeting that will resist puncture), sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property should be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. (See Chapter 10.)

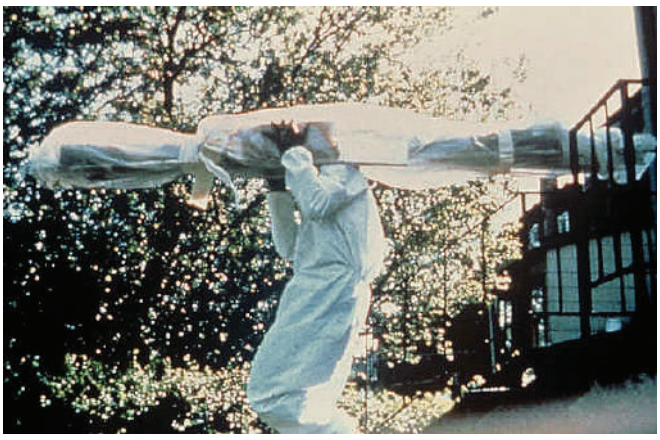


FIGURE 14.6 Removing large debris.

2. Dust and Small Debris

Dust and small debris should be vacuumed and wet wiped or mopped, or, alternatively, after being misted with water, it should be swept up, collected, and disposed of properly. The swept debris should be placed in heavy duty (double 4-mil or single 6-mil polyethylene plastic bags or equivalent), properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded, as overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Exterior and interior areas potentially affected by exterior lead hazard control or other paint-disturbing work should

be protected with a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior containment, the protective sheeting on the ground should be removed at the end of each work day. On a daily basis, as well as during final cleaning, the immediate exterior area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6- mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris (see Figure 14.7). Vacuuming is appropriate for hard exterior surfaces, but not for soil.

FIGURE 14.7 Exterior clean up.

4. Worker Protection Measures

Worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while sweeping, lead hazard control workers may be exposed to high levels of airborne dust. When appropriate, workers should wear protective clothing and equipment respiratory protection.

5. Maintaining Containment

The integrity of the protective sheeting used in a lead hazard control project should be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with durable sheeting (e.g., 6-mil polyethylene) and duct tape.

V. Final Cleaning Procedures

Before treated surfaces can be painted or sealed, final cleaning should be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control or other paint-disturbing work has ceased in the room.

A. Decontamination of Workers, Supplies and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools and materials prior to their removal from containment areas should be implemented, as described below and in Chapter 9.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered, cleaned, or placed in sealed bags. All vacuums and tools that were used should be wiped using rags wetted with detergent solution. In addition, workers should dispose of the rags.

Consumable/disposable supplies, such as mop heads and rags, should be replaced after each dwelling is completed. Using a contaminated mop head can be a major impediment to achieving clearance. Soiled items should be handled and disposed of in accordance with guidance provided in Chapter 10.

FIGURE 14.8 Vacuuming the floor containment.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site. The cleaning should consist of a thorough vacuuming followed by wet wiping.

B. Cleaning and Removal of Protective Sheeting

Protective sheeting should be cleaned before being removed. This minimizes the generation of airborne dust and/or spillage of dust and debris while the sheeting is being folded up and bagged. Remove large debris as described above in Section IV.C.1. Clean dust and small debris by vacuuming and wet wiping or mopping (see Figure 14.8). Remove upper-level sheeting, such as that on cabinets and counters, first, after it has been cleaned. When removing sheeting, it should be carefully rolled or folded up so that the more-contaminated side is inward. Next, remove sheeting from the floor. All protective sheeting should be folded carefully from the corners/ends to the middle to trap any remaining dust.

Protective sheeting used to isolate work areas from other spaces should remain in place until after the cleaning and removal of other sheeting. These should then be vacuumed, wet-wiped, and removed last.

Removed sheeting should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this removal process usually requires workers to use protective clothing and respiratory protection, especially for high-dust jobs.

C. Vacuuming and Wet Cleaning

After the protective sheeting has been removed, the entire area should be cleaned, using the combination of vacuuming and wet cleaning recommended below. The area to be cleaned is the area that will be subject to the clearance examination, including all rooms, hallways, stairways, elevators, etc. used by workers as passageways to and from the work area, plus areas used to store tools and bagged or packaged debris from the work. (See Section IV.A of Chapter 15 regarding the determination of the clearance area.) Porches, sidewalks, driveways, and other hard exterior surfaces should be vacuumed if exterior hazard control or other paint-disturbing work was conducted, or if debris was stored or dropped on such surfaces.

Interior cleaning for high-dust jobs should begin on the ceilings and end on the floors (following the catch phrase "ceiling to floor and out the door") For low-dust jobs, it is not necessary to clean ceilings and walls unless paint-disturbing work has been conducted on those surfaces. (See Chapter 8 for a description of low-dust and high-dust jobs.) Cleaning should be sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Surfaces frequently cleaned include ceilings, walls, floors, window panes and mullions, interior window sills, window troughs, exterior window sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

Surfaces such as porous concrete, old uncoated, worn and porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

After a high-dust job, the recommended first cleaning step is vacuuming to pick up large amounts of dust and small debris. All surfaces should be vacuumed: ceilings, walls, windows, doors, shelves, floors, etc. Research indicates that walls and ceilings retain leaded-dust after lead hazard control projects (Dixon, 2004). Vacuuming is especially important if some of the surfaces are rough. The second step is a wet cleaning, using the wipe or mopping method, as described above in Section III.D. Wet cleaning is probably the most effective method of picking up small particles of lead-dust (California Dept. of Health Services, 2004). (Be sure to vacuum and wet-wipe window troughs, because they are tested for dust-lead by the clearance examiner.) Vacuuming and wet-cleaning once should be sufficient if the surfaces are smooth, but it is recommended that rough surfaces be vacuumed a second time, after the wet-cleaned surface has dried, to increase the likelihood of achieving clearance. As an alternative to the second vacuum pass, some contractors have found that better clearance results on rough surfaces are achieved by thoroughly wiping by hand the wet-cleaned surface until it is dry, using disposable towels (Rupp, 2003). The amount of wiping needed to clean a surface may depend on how soiled it is, as well as its smoothness or roughness.

After low-dust jobs, the first pass with the vacuum is usually not necessary, especially if the surface is smooth. It is often effective to begin with a wet cleaning. But if there is a substantial amount of dust or small debris on the surfaces to be cleaned, begin with the vacuum and then go to the wet cleaning. This will make the wet cleaning more efficient. Vacuuming following the wet cleaning is recommended for rough surfaces but may not be necessary for smooth surfaces. It is generally not necessary to clean ceilings and walls after low-dust jobs, unless paint disturbing work has been conducted on those surfaces. Remember to clean the window troughs. These recommendations are summarized in Table 14.1.

Table 14.1 Summary Guidance on Cleaning Methods by Dustiness of Work and Condition of the Surface.

Conditions	Cleaning Procedure	Surfaces
High-dust job, with some rough surfaces	Vacuum, wet clean, vacuum (after surface is dry)	All surfaces, including ceilings, walls, and window troughs.
High-dust job, with all smooth surfaces	Vacuum, wet clean	
Low-dust job, with some rough surfaces	Vacuum (optional, depends on amount of dust), wet clean, vacuum (after surface is dry)	All surfaces except ceilings and walls, unless those surfaces have been treated.
Low-dust job, with all smooth surfaces	Vacuum (optional, depends on amount of dust), wet clean	

FIGURE 14.9 **Inspecting for completeness of the work performed.**

D. Supervisor's Preliminary Visual Inspection

After the cleaning is completed, the supervisor should visually evaluate the entire area subject to clearance (including work areas, worker passageways and storage areas) to ensure that all work has been completed and all visible dust and debris has been removed (see Figure 14.9). The supervisor's preliminary inspection does not replace the independent visual assessment and dust testing conducted by the clearance examiner. If the clearance examiner's visual assessment results are unsatisfactory, dust testing is postponed until identified surfaces are recleaned and/or retreated. This process makes it cost effective to have the supervisor perform a preliminary visual inspection.

E Surface Painting or Sealing of Non-Floor Surfaces

The next step of preparing for clearance (or cleaning verification) is painting or otherwise sealing all treated surfaces except floors. Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not painted are exempt from the painting provision.

Painters should use the following lead-safe work practices:

- Using "drop cloths," which should be disposable, impermeable sheeting – not cloth,
- Cleaning their work tools before bringing them into the clearance area, and
- Ensuring no dust is tracked in from outside the clearance area.

F. Sealing Floors

The next step before clearance is to seal all hard-surface floors that do not already have an intact, nonporous coating. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate floor wax (or equivalent product). Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

Workers applying floor sealants or coverings should take care to wipe clean tools brought into the work area and to avoid tracking in dust from outside the clearance area.

G. Final Wet Cleaning, EPA Cleaning Verification, and Possible Pre-Clearance Dust Testing

Even if painters and floor covering workers use lead-safe work practices, lead-contaminated dust may still migrate into previously cleaned areas. Therefore, it is recommended that the final step before the clearance examination is to wet clean all horizontal surfaces one more time (see Figures 14.10 through 14.13).

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.

Begin at the top of each room and work down. For example, start with the top shelves, the top of the wood work, and so on, and work down to the floor. Do every inch of the window, especially the window trough.

Courtesy: Alice Hamilton Occupational Health Center

FIGURE 14.10 The HEPA Vacuum-Wet Wash-HEPA Vacuum Cycle Helps Meet Clearance Standards.

Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.

Wipe All Surfaces

Wet Mop Floor

Don't Dry Sweep

FIGURE 14.11 Wet Cycle Requires Washing All Surfaces with Suitable Detergents.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.

Squeeze out the mophead in empty bucket #2. Return no bucket #1 for more detergent solutions and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

Use the 3-Bucket System

FIGURE 14.12 Use a Three-Bucket System and Then HEPA Vacuum Again to Minimize Recontamination.

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.

FIGURE 14.13 HEPA vacuum all surfaces a final time.

Under EPA's Renovation, Repair and Painting rule, after the renovation has been completed, the firm must clean the work area until no dust, debris or residue remains (see Appendix 6). The post-renovation cleaning verification requirements must be performed by a certified renovator. If the certified renovator directs the other workers to perform the work practices, the certified renovator must be at the work site during cleaning of the work site. For more information on EPA's RRP rule and the cleaning it requires, see ***www.epa.gov/lead/pubs/renovation.htm***.

At this point in the process, supervisors of work for which achievement of clearance is known to be difficult may wish to consider preliminary dust testing before requesting the clearance examination. Factors that tend to be associated with clearance failure are (1) high levels of lead in dust and paint before the work began, (2) hard floor and window surfaces that are not smooth and cleanable, and (3) high-dust work in rooms from which furniture has not been removed (NCHH, 2004).

Methods exist for reliably screening wipe samples on-site instead of in a fixed laboratory. These include portable X-ray fluorescence (XRF) analysis and anodic stripping voltammetry (ASV) (Ashley 2001; EPA, 2002b; Clark, 2002) or potentiometric stripping analysis (PSA). These methods may provide testing results much more quickly than fixed laboratory analysis, because transportation of samples is not necessary and handling time is reduced. Note that analysis of samples taken from target housing of pre-1978 child-occupied facilities must be conducted by a laboratory, whether fixed-site or mobile, recognized by the Environmental Protection Agency (EPA) under its National Lead Laboratory Accreditation Program (NLLAP) (***http://www.epa.gov/lead/pubs/nllap.htm***).

Any person who is trained and otherwise qualified to operate the XRF instrument or use the ASV method may use these methods to conduct *preliminary* dust testing to determine whether the clearance area is clean and ready for the clearance examination. A person conducting a preliminary screen does not have to be a technician working for an NLLAP-recognized laboratory; the sample may be collected by the contractor or the owner, and given to the laboratory for analysis. Owners and contractors may wish to use such screening tests to minimize the likelihood of clearance failure. Federal and State regulations on the use of devices with radioactive elements (i.e., some XRF analyzers) must be observed (see Chapter 7, section VII.A).

H. Clearance

The clearance examination should take place more than 1 hour after the final cleaning. This ensures that any airborne lead particles stirred up by the cleaning have settled. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures. For cleaning verification, a waiting period is not required for the initial wipe, nor after the first failed wipe, but a 1-hour waiting period is required after the second failed wipe before the work area is released from the project.

I. Recleaning After Clearance Failure

If the area fails the clearance examiner's visual assessment or clearance dust sampling tests, all surfaces represented by the failing clearance dust wipe samples must be recleaned. Failure is an indication that the cleaning has not been successful. If the surfaces are smooth, a wet wash should be used. If the surfaces are rough, a vacuum, wet-cleaning, vacuum cycle is recommended. If the failing surfaces include carpeting, the decision must be made whether to try to clean the carpet or to dispose of it. See Section V.B.2 of Chapter 11 for guidance. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

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