Appendix 1: Units of Measure Used in the Lead-Based Paint Field

Many of the units, terms, and concepts used in these Guidelines are new to the users. Most of the measures cited are in the Metric System of measure, rather than the English System that most people in the United States use on a daily basis. For this reason, a brief discussion of the most important concepts will be helpful to the user to develop a feeling for the quantities and terms used.

Terms and Definitions

An atom is one of the smallest units of matter, identifying a specific element. Lead is an element and is composed of atoms of lead; each lead atom behaves the same way when it interacts with other atoms. A molecule is a cluster of bound atoms which behave as a unit when interacting with atoms or other molecules. Materials made up of molecules are called compounds. The chemical and physical properties of compounds are unlike those of the elements which are present in them. Lead oxide, lead chromate, and lead acetate are all molecules formed when lead atoms combine with atoms of other elements to form molecules. These molecules are called lead compounds or sometimes lead salts. Lead acetate is a lead compound which has a sweet taste and is called "sugar of lead."

An electron is a negatively charged particle that orbits the positively changed nucleus of the atom. Every element requires a different number of electrons to neutralize the atom's positive nuclear charge. If an electron is removed from an atom then the atom becomes positively charged and is called an ion.

An X-ray is a type of high energy electromagnetic radiation. Heat and light are other forms of electromagnetic radiation. Atoms of a particular element emit a characteristic set of X-rays when excited. No two elements emit identical sets of X-rays. The unit of energy we use in talking about X-rays is the kiloelectron volt (one thousand electron volts), abbreviated keV. Lead "K" X-rays have energies between 72 to 87 keV. A gamma ray is electromagnetic radiation which is emitted from the nucleus of a radioactive atom. Most gamma rays emitted by radioactive Cobalt 57 have an energy of 122 keV, more than enough energy to interact with lead atoms in paint and produce lead "K" X-rays. A 122 keV gamma ray will penetrate through many paint layers and into the substrate. Lead "K" X-rays can also penetrate many layers of paint and even through some walls or doors.

Mass Units

Large units of mass and their abbreviations:

> Gram (g or gm): A unit of mass in the metric system. A nickel weighs about 1 gram. A gram is equal to about 35/1000 (thirty-five thousandths of an ounce. Another way to think of this is that 28.4 g are equal to 1 ounce.

Kilogram (kg): The prefix "kilo-" means "1000 times". A kilogram is a unit of mass in the metric system that refers to 1000 grams or about 35 ounces. 35 ounces is about 2.2 pounds. 454 g are equal to 1 pound.

Small units of mass and their abbreviations:

Milligram (mg): The prefix "milli-" means "1/1000 of " (one thousandth of). A milligram is 1/1000 of a gram or about 35/1,000,000 (thirty-five millionths) of an ounce. 28,400 mg are equal to 1 ounce.

Microgram (µg): The prefix "micro-" means "1/1,000,000 of" (one millionth of). A microgram is 1/1,000,000 of a gram or 1/1000 of a milligram. A microgram is equal to about 35/1,000,000,000 (thirty-five billionths) of an ounce. 28,400,000 µg are equal to 1 ounce.

Length Units

Large units of length and their abbreviations:

Meter (M): A meter is a metric unit of length equal to about 39.37 inches, which is 3 and 37/100 of an inch longer than a yard.

Decimeter (dm): The prefix "deci-" means "1/10 of". A decimeter is 1/10 of a meter. Another way to say this is that one meter will contain 10 decimeters. A decimeter is about 3.937 inches.

Centimeter (cm): The prefix "centi-" means "1/100 of". A centimeter is about 39/100 of one inch. 1 inch contains about 2.54 centimeters.

Small units of length:

Millimeter (mm): The prefix "milli-" means "1/1000 of". There are 1000 mm in 1 M. There are 10 mm in 1 cm. 25.4 mm equals 1 inch.

Micrometer (µm): The prefix "micro-" means "1/1,000,000 of". There are 1,000,000 µm in 1 M. There are 1000 µm in 1 mm and 10,000 µm in 1 cm. The term micron is also used interchangeably for µm. There are 25,400 microns is 1 inch.

Nanometer (nm): The prefix "nano-" means "1/1,000,000,000 of" (one billionth of). A meter can be divided into 1 billion nanometers. The wavelength of the light that is visible to us is in the range from about 350 to 700 nanometers; 450 nm is the wavelength of blue light; 550 nm, green light; 650 nm, red light. X-rays have much shorter wavelengths than visible light because they have more energy.

One more small unit encountered in discussing paint films is not a Metric unit but an English unit. The unit that paint film thicknesses are usually measured in is the "mil". A mil is equal to 1/1000 of one inch. A 2 mil paint film per coat is considered average,

assuming that the paint contains about 50% solids and has a spreading rate of 400 ft²/gallon. This would correspond to a paint film thickness of about 50 µm for a single coat of paint. 1 mil is equal to about 25.4 microns. Plastic films are also measured in mil.

Conversion to Areas and Volumes

An area is a measure of the length times the width of some object. The area is expressed as a "square unit" (²). Square feet (ft²) is an area unit. Similarly, in the metric system we can have square meters (M²) or square centimeters (cm²).

1 ft² = 929 cm²
1 square cm = 1 cm²
1 square inch = 1 in²

The volume is a measure of an area times a height of a cylindrical object. The volume is expressed as a cubic unit (³) such as a cubic foot (ft³). A liter is a metric unit of volume equivalent to 1000 cm³ or 1000 cubic centimeters, abbreviated cc. A milliliter is 1/1000 of a liter and is abbreviated ml. The terms cm³, cc and ml are used interchangeably to refer to small liquid volumes. In the English System we use quarts, gallons, etc., as volume measures. A liter is equal to 1.057 quarts.

Concentration Units

Weight per cent or % by weight (%w/w): The weight of lead in some mass unit per 100 weights of the total sample (in the same mass units). For example, if a 1 gram paint sample contains 0.1 g of lead, then the paint is 10.0% lead by weight (w/w). Also, 1 ounce of lead in 10 ounces of paint is 10% w/w lead. All weight per cent measurements refer to the dried paint film.

Parts per million (ppm): The weight of lead per 1,000,000 weights of the total (including lead) sample. For example, if a paint sample contains 5,000 µg of lead in 1 g of paint, then the lead concentration is 5,000 PPM or 0.5% w/w.

Area concentration: A mass of lead per unit area of the total paint sample, sometimes called "loading". This is independent of the volume (or thickness) of the paint sample. This unit is encountered in measuring paint by portable X-ray fluorescence instruments and laboratory techniques. The HUD regulatory level is 1.0 mg/cm² or 1000 µg/cm². Area concentration (loading) is also used to describe settled leaded dust levels in µg/ft² (micrograms of lead per square foot of surface area). 200 µg/ft² equals 1.85 mg/m² (milligrams of lead per square meter).

One cannot convert from ppm or % by weight to area concentration (mg/cm²) as measured by an X-ray fluorescence instrument in any predictable way unless the total mass per unit area of the sample is known. One reason is that the dilution factor of adding more non-leaded paint layers over an existing leaded one will not change the area concentration. However, adding additional layers of paint will change the % by weight. The area concentration is independent of the thickness of the paint layers. The XRF determines the lead mass per unit area as measured by X-ray emission from a lead layer (mg/cm²). The weight percent method measures the percent

of lead in the bulk paint films by determining the weight of lead in the total paint sample.

Consider the case of many layers of paint each containing 0.5% lead by weight. The theoretical concentration limit for all the layers together cannot exceed 0.5% but if (about) 20 or more layers are present then the corrected XRF response may indicate 1.0 mg/cm² or higher. The 1 mg/cm² regulatory level is, in this case, a more stringent standard than the 0.5% standard. Conversely, consider the case of a leaded paint layer with 10% lead by weight. If another layer of non-leaded paint of the same thickness and density is added to the leaded paint layer, the concentration of both layers together would be: 10%/2 layers=5%.

Also, one cannot convert ppm in leaded dust to loading (µg/ft²) unless the total weight of the dust is known. The total weight of dust cannot be determined by wipe sampling.

Some examples will serve to illustrate the concepts and quantities indicated in the previous discussion.

If we assume that a gallon of paint (12 lbs/gallon) having almost 50% solids and 12% lead is applied over 400 square feet, the area lead concentration would be

$$\frac{(0.5)(0.12)(12 \text{ pounds/gallon})(1000 \text{ mg/g})}{(400 \text{ ft})^2\text{gallon})(2.54 \text{ cm/in})^2\ (12 \text{ in/ft})^2\ (0.0022 \text{ pounds/g})} = 0.88 \text{ mg/cm}^2$$

This example illustrates that, in theory, 1 mg/cm² corresponds to a lot of lead in a single layer of paint (about 12% lead). Because of the presence of many layers of paint in target housing, on average 1 mg/cm² is about equal to 1% lead.

To conceptualize quantities of lead in paint we can make some reasonable assumptions. If one assumes a lead pigment particle size of about 1 mm in diameter, and that the particles are about the size of grains of salt (but heavier) and that one of these pigment grains weighs about 30 µg, only about 30 of these grains distributed in an area of 1 cm² will be required to give an area concentration near 1 mg/cm². The lead pigment particles will actually occupy only a small fraction of the total 1 cm² area. This small amount will usually be visible to the eye, under conditions of good light and contrast, on an abated surface, if present as a post-abatement residue.

Can painting over leaded dust create a lead-based paint? While one could conceivably apply the definition of lead-based paint (5,000 ppm) and assume a certain thickness in the new paint film to calculate the weight concentration of lead in the new paint film from the dust loading in µg/ft², the result is well above the dust clearance standards. Consider the following example: If, after treatment, 35,000 µg/ft² of leaded dust remains on the surface, and it is painted over with a lead-free new paint at a rate of 400 ft²/gallon with a density of 12 lbs/gallon and 50%

solids by weight, the total weight of the paint solids per unit area is 7.3 mg/cm². Thus, the weight percent concentration of lead in the new paint film would be about 5,000 ppm:

$$\frac{(12 \text{ pounds/gallon})(0.5)(0.488 \text{ g/cm}^2 \text{ / pounds/ft}^2)(1000 \text{ mg/g})}{400 \text{ ft}^2\text{/gallon}} = 7.3 \text{ mg/cm}^2$$

$$35{,}000 \text{ µg/ft}^2 \ (0.001 \text{ mg/µg}) \ (1 \text{ ft}/12 \text{ inches})^2 \ (1 \text{ inch}/2.54 \text{ cm})^2 = 0.038 \text{ mg/cm}^2$$

$$\text{ppm by weight} = \frac{0.039 \text{ mg/cm}^2}{7.3 \text{ mg/cm}^2} \text{ X } 1{,}000{,}000 = 5{,}200 \text{ ppm}$$

Since the current HUD standard for lead-based paint is 5,000 ppm (0.5%), this means that the new lead-free paint would become lead-based paint. However, it is extremely unlikely that 35,000 µg/ft² would be found on stripped surfaces if the surfaces have been stripped and cleaned adequately.

If one relied on XRF testing to determine lead contamination of surfaces where the lead paint had been removed, it would almost certainly be necessary to correct for substrate effects, since the readings would probably be quite low. If some of the lead did soak into the substrate during the removal process, determination of the true substrate effect would be quite difficult, if not impossible. Current XRF instruments have detection levels well above 0.038 mg/cm².

The diameter of a lead particle found in paint will be on the order of 0.1 to 10 micrometers (µm). Scraping, sanding, and heating lead-based paint will result in the formation of small particles. These particles are usually much smaller than the salt grain examples used above. These very small particles actually float in the air and can be inhaled as we breathe. Very small particles do not settle very rapidly. For this reason very stringent worker protection and clean-up measures are needed for lead hazard control work in lead-based paint abatement.

Heat gun removal at temperatures below 1,100°F will not melt and vaporize lead into the air. It could, however, produce paint "soot" particles from the paint film which will trap the tiny lead particles and allow them to become airborne. Welding and open flame burning temperatures melt and vaporize lead compounds in paint; these temperatures are much higher than those generated by heat guns.

Biological Quantities of Lead in Lead-Based Paint

Blood lead levels are expressed in micrograms of lead (µg) per deciliter of blood (dl). A deciliter is one tenth of a liter. Blood lead levels are reported in µg/dl. A child can eliminate approximately 5 micrograms of lead for each kilogram of body weight in one day. If a ten kilogram (22 lb) child ingested a paint chip containing 1.0 mg of lead, that child would ingest approximately 20 times more lead than could be eliminated by his body in one day (assuming that the digestive system were able to digest the entire paint chip). If we allow that only 10% of the lead in the paint chip is absorbed into the child's body then the child would still ingest twice as much lead, from one paint chip, as his body could eliminate in 24 hours.

Dr. Julian Chisholm in "Lead Based Paint in Housing", National Institute of Building Sciences LBP Task Force Report, February 20, 1988, pp. 23-24, writes:

> *Experimental and human data indicate that chronic average daily ingestion of lead of 16.8 µg Pb/kg of body weight or 168 µg Pb/day in a 10 kg child from paint could raise blood lead concentrations from 20 to 54 µg/dl.*

Currently, the definition of an elevated blood lead level in children is 10 µg/dL.

Appendix 2: CDC's Childhood Lead Poisoning Prevention Program

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Listed alphabetically (year first funded)
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Appendix 3: U.S. EPA Regional Offices

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EPA Region II - (NJ, NY, PR, VI)
Air & Waste Management Division
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New York, NY 10278
(212) 264-5175

EPA Region III - (DE, MD, PA, VA, WV, DC)
Waste Management Branch
841 Chestnut Street
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EPA Region IV - (AL, FL, GA, KY, MS, NC, SC, TN)
Hazardous Waste Management Division
345 Courtland Street, NE
Atlanta, GA 30365
(404) 347-3016

EPA Region V - (IL, IN, MI, MN, OH, WI)
RCRA Activities
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Chicago, IL 60604
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EPA Region VI - (AR, LA, NM, OK, TX)
Air & Hazardous Materials Division
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EPA Region VII - (IA, KS, MO, NE)
RCRA Branch
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EPA Region VIII - (CO, MT, ND, SD, UT, WY)
Waste Management Divsion (8HWM-ON)
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Toxics & Waste Management Division
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EPA Region X - (AK, ID, OR, WA)
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Appendix 4: OSHA Regional Offices

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Region III: DE, DC, MD, PA, VA, WV
U.S. Department of Labor - OSHA
Gateway Building, Suite 2100
3535 Market Street
Philadelphia, PA 19104
(215) 596-1201
Fax: (215) 596-4872

Region IV: AL, FL, GA, KY, MI, NC, SC, TN
U.S. Department of Labor - OSHA
1375 Peachtree Street, SE, Suite 587
Atlanta, GA 30367
(404) 347-3573
Fax: (404) 347-0181

Region V: IN, IL, MI, MN, OH, WI
U.S. Department of Labor - OSHA
230 South Dearborn Street, Room 3244
Chicago, IL 60604
(312) 353-2220
Fax: (312) 353-7774

Region VI: AR, LA, NM, OK, TX
U.S. Department of Labor - OSHA
525 Griffin Street, Room 602
Dallas, TX 75202
(214) 767-4731
Fax: (214) 767-4137

Region VII: IA, KS, MO, NE
U.S. Department of Labor - OSHA
911 Walnut Street, Room 406
Kansas City, MO 64106
(816) 426-5861
FAX: (816) 426-2750

Region VIII: CO, MT, ND, SD, UT, WY
U.S. Department of Labor - OSHA
Federal Building, Room 1576
1961 Stout Street
Denver, CO 80294
(303) 844-3061 x301
FAX: (303) 844-5310

Region IX: AZ, CA, HI, NV, American Samoa, Guam, Trust Territory of Pacific Islands
U.S. Department of Labor - OSHA
71 Stevenson Street, Suite 420
San Francisco, CA 94105
(415) 744-6670
FAX: (415) 744-7114

Region X: AK, ID, OR, WA
U.S. Department of Labor - OSHA
1111 Third Avenue, Suite 715
Seattle, WA 98101-3212
(206) 553-5930
FAX: (206) 553-6499

Appendix 5: EPA-Sponsored Regional and Local Lead Training Centers and Providers

Regional Centers

EPA Regions I & II
Northeast Regional Environmental
Public Health Center
School of Public Health
Public Health Building
University of Massachusetts
Amherst, MA 01003
Phone: (413) 545-4222
Fax: (413) 545-4692

EPA Regions III & V
Department of Environmental Health
University of Cincinnati
3223 Eden Avenue, ML-056
Cincinnati, OH 45267-0056
Phone: (513) 558-1749
Fax: (513) 558-1756

University of Maryland at Baltimore
Regional Lead Training Center
28 East Ostend Street
Baltimore, MD 21230
Phone: (410) 706-1849
Fax: (410) 539-2087

EPA Regions IV & VI
Georgia Tech Research Institute
Environmental Science & Technology Laboratory
Georgia Institute of Technology
Atlanta, GA 30332
Phone: (404) 894-3806
Fax: (404) 894-2184

EPA Regions VII & VII
University of Kansas
12600 Quivira Road
P.O. Box 25936
Overland Park, KS 66225-5936
Phone: (913) 491-0221
Fax: (913) 491-0509

EPA Regions IX & X
Environmental Health & Safety
University of California, San Diego
University Extension, 0176
9500 Gilman Drive
La Jolla, CA 92093-0176
Phone: (619) 534-6157
Fax: (619) 558-8156

Environmental Hazard Management Program
University of California, Davis
University Extension
1333 Research Park Drive
Davis, CA 95616-8727
Phone: (916) 757-8606
Fax: (916) 757-8558

Local Centers
Assistant Director, Health & Safety
Department of Research
American Federation of State, County & Municipal Employees
1625 L Street, NW
Washington, DC 20036-5687
Phone: (202) 429-1000
Fax: (202) 429-1293

Center for Neighborhood Technology
2125 West North Avenue
Chicago, IL 60647
Phone: (312) 278-4800
Fax: (312) 278-3840

School of Public Health East
University of Illinois at Chicago
2121 West Taylor Street
Chicago, IL 60612
Phone: (312) 996-5756
Fax: (312) 996-5356

Indiana C.A.P. Directors' Association, Inc.
902 North Capitol Avenue
Indianapolis, IN 46204-1005
Phone: (317) 636-8819

Environmental & Occupational Safety Trng
Division of Continuing Education
Louisiana State University
177 Pleasant Hall
Baton Rouge, LA 70803
Phone: (800) 256-6948
Fax: (504) 388-6324

The New England Consortium
Work Environment Laboratory
University of Massachusetts-Lowell
Lowell, MA 01854
Phone: (508) 934-3257
Fax: (508) 452-5711

Alice Hamilton Occupational Health Trng Ctr
8200 Professional Place, Suite 104
Landover, MD 20785
Phone: (301) 731-8530/(202) 543-0005
Fax: (202) 543-1327

Southeast Michigan Coalition on
Occupational Safety & Health
2727 Second Avenue
Detroit, MI 48201
Phone: (313) 961-5685
Fax: (313) 961-3588

Chicago Area Committee on Occupational
Safety & Health
37 South Ashland Avenue
Chicago, IL 60607
Phone: (312) 666-1611
Fax: (312) 996-5356

Midwest Center for Occupational
Health and Safety
University of Minnesota
640 Jackson Street
St. Paul, MN 55101
Phone: (612) 221-3992
Fax: (612) 292-4773

Minnesota Building Research Center
330 Wulling Hall
86 Pleasant Street, SE
Minneapolis, MN 55455
Phone: (612) 626-7419

Cornell University
New York State School of Industrial and
Labor Relations
Chemical Hazard Information Program
Capital District Office
146 State Street, 4th Floor
Albany, NY 12207-1605
Phone: (518) 449-4161
Fax: (518) 426-0643

Cleveland Lead Hazard Abatement Center
Department of Public Health
City of Cleveland
1925 St. Clair Avenue
Cleveland, OH 44114
Phone: (216) 664-3202
Fax: (216) 664-2197

Energy Conservation Program
Corp. for Ohio Appalachian Development
P.O. Box 787, 1 Pinchot Place
Athens, OH 45701-0787
Phone: (614) 594-8499
Fax: (614) 594-8499

Greater Cincinnati Occupational Health Ctr
Jewish Hospital Evendale Medical Building
10475 Reading Road, Suite 405
Cincinnati, OH 45241
Phone: (513) 769-0561
Fax: (513) 769-0766

The University of Findlay
1000 North Main Street
Findlay, OH 45840
Phone: (419) 424-4647
Fax: (419) 424-4822

Oregon State University
OSU/342 Snell Hall
Corvallis, OR 97331
Phone: (503) 737-1288
Fax: (503) 737-2734

Consortium of Occupational Health Professional
857 Valley View Road
Flourtown, PA 19031
Phone: (215) 842-6540

Pennsylvania College of Technology
One College Avenue
Williamsport, PA 17701-5799

Occupational & Environmental Safety
Training Division
Texas Engineering Extension Service
Texas A&M University System
College Station, TX 77843-8000
Phone: (409) 845-7952
Fax: (409) 845-3419

Rocky Mountain Center for Occupational &
Environmental Health
University of Utah
Building 512
Salt Lake City, UT 84112
Phone: (801) 581-5710
Fax: (801) 581-7224

Office of Continuing Education
College of Health Sciences
Old Dominion University
Norfolk, VA 23529-0290
Phone: (804) 683-4256

Wisconsin Energy Conservation Corp.
2158 Atwood Avenue
Madison, WI 53704
Phone: (608) 249-9322
Fax: (608) 249-0339

Institute for Safety & Health Training
West Virginia University
130 Tower Lane
P.O. Box 6615
Morgantown, WV 26506-6615
Phone: (304) 293-3096
Fax: (304) 293-5905

Marshall University
School of Medicine
Division of Occupational & Environmental
Health
1801 6th Avenue
Huntington, WV 25755-9420

Appendix 6: Other Organizations Providing the EPA Lead-Based Paint Abatement Supervisor and Inspector Course Curriculum

This list is not complete and is simply a compilation of training providers made available to HUD at the time of publication. All training providers who contacted HUD and indicated a desire to be included are listed below. HUD does not recommend one training provider over any other. This listing is for informational purposes only. Other training providers can be identified through the local telephone directory or trade publications.

AFSCME
1625 L Street, NW
Washington, DC 20036
(202) 429-1232

The Aulson Company, Inc.
191 S. Main St
Middleton, MA 01949
800 - 998-0212

Insulation Industry Apprentice and Training Fund
1680 E. Gude Drive
Rockville, MD 20850
(301) 294-3193

Leadtec Services
8841 Orchard Tree Lane
Baltimore, MD 21286
410-682-5323

International Brotherhood of Painters
1750 New York Avenue, NW
Washington, DC 20006
(202) 637-0740

Laborers' Health & Safety Fund
905 16th Street, NW
Washington, DC 20006
(202) 628-2596

National Ironworkers & Employers
1750 New York Avenue, NW #400
Washington, DC 20006

National Training Fund/SM&ACI
Edward Carlough Plaza
601 N. Fairfax Street, #240
Alexandria, VA 22314
(703) 739-7200

United Brotherhood of Carpenters
101 Constitution Avenue, NW
Washington, DC 20001
(202) 546-6206

Committees on Occupational Safety and Health that provide Lead Abatement Training

Alaska Health Project
1818 W. Northern Lights Blvd., Ste 103
Anchorage, AK 99517
(905) 279-3089

Alice Hamilton Occupational Health Center
408 7th Street, SE
Washington, DC 20003
(202) 543-0005/(301) 731-8530

Maine Labor Group on Health
Box V
Augusta, Maine 04330
(207) 622-7823

MASSCOSH
555 Amory Street
Boston, MA 0 2130
(617) 524-6686

SEMCOSH
2727 Second Street
Detroit, MI 48206
(313) 961-3588

WASHCOSH
677 E. Marginal Way South
Building D
Seattle, WA 98108
(206) 433-4721

Western MASSCOSH
458 Bridge Street
Springfield, MA 01103
(413) 731-0760

NORTHEAST REGION

CON-TEST Education Resource Center
39 Spruce Street, P.O. Box 591
East Longmeadow, MA
(800) 626-8378

Environmental and Occupational Health Sciences Institute (EOHS)
45 Knightsbridge Road
Piscataway, NJ 08854-3923
(908) 235-5062

FailSafe Risk Management Alternatives, Inc.
433 River Street, Bldg. E
Troy, NY 12180
(518) 270-8391

Quality Control Services, Inc.
10 Lowell Junction Road
Andover, MA 01810
(508) 475-0623

US Lead Training Institute, Inc.
206 S. Third Street, 2nd Floor
Philadelphia, PA 19106
(215) 625-3512

GREAT LAKES & MID-ATLANTIC REGION

Industrial Training Company
551 W. Grace Street
Richmond, Va 23220-1132
(804) 648-7836

Occupational Training Services
700 S. Pulaski Road, Bldg. 200
Chicago, IL 60652
(708) 385-1325

Professional Service Industries, Inc.
510 East 22 Street
Lombard, IL 60148
(708) 990-8282

Retraining Centers/USA 2000
34 South High Street
Akron, OH 44308
(800) 849-4083

SOUTHERN REGION

Environmental Resource Center
101 Centre Point Drive
Cary, NC 27512
(919) 469-1585

Gebco Associates, Inc.
669 Airport Freeway
Hurst, TX 76053-3962
(817) 268-4006

Health & Hygiene
420 Gallimore Road
Greensboro, NC 27409
(910) 665-1818

NATEC of Texas, Inc.
8981 Interchange Drive
Houston, TX 77054
(800) 446-2832

Seagull Environmental Training
903 Northwest Sixth Avenue
Fort Lauderdale, FL 33311
(800) 966-9933

University of Alabama
College of Continuing Studies
Box 870388
Tuscaloosa, AL 35487
(205) 348-3028

University of Florida
TREEO Center
3900 SW 63rd Boulevard
Gainesville, FL 32608
(904) 392-9570

University of North Carolina
Occupational Safety and Health Educational Resource Center
109 Connor Drive, Suite 1101
Chapel Hill, NC 27514
919-962-2101

WESTERN REGION

Occupational Knowledge, Inc.
2030 Franklin Street, Suite 220
Oakland, CA
(510) 444-0163

Health & Environmental Technology Center
Moore-Norman Area Vo-Tech Center
4701 12th Ave NW
Norman, OK 73069
800-872-4623

University of California
UC Berkeley Extension, Environmental Management
2223 Fulton Street
Berkeley, CA 94720-7012
(510) 643-7143

Appendix 7.1: Elements of Inspection and Risk Assessment RFPs

A. Scope of Work—A detailed description of the services to be provided.

1. List of Housing Locations, Site Plans, and Location Maps.

2. Description of Structures: Describe building type, construction, painting history (if known), special conditions.

3. Unit Size Breakdowns for Each Development: Require that sampling include all bedroom sizes in the proportion that they occur in each development.

4. List of Common Areas, Management and Community Facilities, and Other Areas to Be Included (For Risk Assessment—Playgrounds and Large Parking Areas).

5. Inspection Report Requirements.

   The Risk Assessment Protocol in Chapter 5 and the Inspection Protocol in Chapter 7 provide specific report formats for risk assessments and inspections. Report requirements may be governed by EPA regulations issued pursuant to Section 402 and 404 of TSCA, or by local authorities.

   For inspection reports, the following may be required: Executive summary (includes a listing of components that tested positive), sections on regulatory compliance, overall scope of work, unit selection methods, field procedures, laboratory and field quality control procedures, Substrate Equivalent Lead determination, data analysis and reduction, laboratory procedures, and application of HUD decisionmaking rules.

B. Standards—References or regulatory standards to be met in providing services.

1. *HUD Guidelines for the Evaluation and Control of Lead Hazards in Housing*.

2. State or Local Regulations, if applicable.

3. Environmental Protection Agency (EPA) regulations.

4. HUD regulations.

5. Occupational Safety and Health Administration (OSHA) Regulations.

6. Nuclear Regulatory Commission (XRF radiation sources).

C. General Instructions.

1. Submission Time and Dates.

2. Notice of Preproposal Conferences and Site Reviews. (Such conferences are strongly recommended so that proposers can review conditions in the field.)

3. Opportunities and Form for Submitting Questions or Comments.

4. Conditions for Issuance of Addenda and Other Clarifications.

5. Conditions for Award of Contract.

6. Proposed Form of Contract. The applicable HUD Handbook includes a model consultant contract for use by housing authorities and other public agencies.

D. Financial, Insurance, and Legal Requirements: If not included in proposed contract, special requirements should be defined.

E. Proposal Format and Content.

1. Required Presentation Format.

2. Transmittal Letter Contents.

3. Statements of:

a. qualifications—certification and training are required (some jurisdictions may also require certifications).

b. related experience—directly applicable experience in performing these services for comparable housing.

c. references.

d. proposed staffing and project organization.

e. work plan/technical approach.

f. base price and unit prices for additional work (e.g., paint chip samples and collection).

F. Proposal Evaluation and Contract Award.

1. Evaluation Criteria Factors.

a. Qualifications, experience, and references.

b. Staffing and organization.

c. Quality of proposed work plan/technical approach.

d. Cost and price.

2. Other Special Requirements—Local preferences, minority participation.

G. Other Issues.

1. Qualifications—For both inspection and risk assessment, qualifications must include certification and/or licensing by a specific State or local agency.

2. Experience—Experience in inspection/risk assessment of similar housing in accordance with HUD protocols.

3. Related Qualifications, Experience, and Training.

a. Experience in inspection (other than lead-based paint), maintenance, renovation, or management of housing similar to the housing units for which services are being sought. This experience is most relevant for risk assessment.

b. Experience in the planning, design, and monitoring of lead-based paint hazard control projects. This experience is most relevant to inspection services.

c. Experience in collecting environmental samples and interpreting test results. Collection and analysis of lead samples such as dust wipes, soil, paint chips, and water samples in housing environments. Applicable to both risk assessment and inspection.

d. Experience in environmental report writing. Ability to outline a lead hazard control strategy with an order of priorities and recommended methodologies.

4. Price.

a. Inspection—Proposals should contain an estimate of the number of XRF measurements and a brief description of locations where XRF measurements will be made in order to demonstrate that costs are reasonable. If this cost breakdown is provided, it will be possible to compare proposals on a systematic basis. The proposal should also contain unit prices for:

i) collection and analysis of paint chip samples if necessary for confirmatory purposes; and
ii) addition or deletion of XRF measurements.

b. Risk Assessment—Proposals should include a breakdown of the total price into:

i) the cost for laboratory analysis of the estimated number of environmental samples to be collected; and
ii) the cost for all other services, including the cost of collecting the samples and other field work and report writing. If this cost breakdown is provided, it will be possible to compare proposals on a systematic basis. The proposal should also contain a unit price for the collection and analysis of additional environmental samples in case they are needed.

5. Proposal Evaluation.

a. Certification, training, and price should be considered in evaluating proposals.

b. Understanding and experience in using HUD Lead-Based Paint Testing and/or Risk Assessment Protocols are essential requirements.

Appendix 7.2: Types of Lead-Based Paint Enclosure Systems

General Notes

The following notes apply to several of the Enclosure Systems used to seal interior and exterior surfaces of walls, ceilings, floors, doors, windows and trim which contain lead-based paint.

a. Application of gypsum board, plywood paneling, or solid board paneling directly to existing wall or ceiling surfaces requires anchorage to structural wood or steel joists or ceiling joists or rafters by suitable screws penetrating the structure at least¾". Attachment may also employ a combination of screws and construction adhesive. For application directly to masonry surfaces, case-hardened masonry nails, of sufficient length to extend into the masonry, and construction adhesive are required.

b. Furring may be required to produce a true and even support for panel or board finish materials. Furring may be wood 1" x 2" strips or metal channels. Resilient metal channels may be used where additional sound attenuation is desired. Furring may be applied vertically or horizontally to accommodate the direction of the finish material. Furring shall be anchored to structural studs, ceiling joists or rafters preferably with bugle-head screws or annular-ringed nails; to steel studs or channel framing, anchorage shall be by bugle-head screws. Anchorage of furring strips to concrete or masonry walls shall be by case-hardened masonry nails, anchors, or toggle bolts. Furring shall not be more than 16" on center of walls or 24" on center for ceilings.

c. Gypsum, cement, or metal lath shall be anchored to structural wood or steel studs, joints, or rafters, or to wood or metal furring by bugle-head screws. Anchorage of metal lath to concrete or masonry walls shall be by case-hardened masonry nails, power or hand drive.

d. All enclosure systems (wood panels, boards, plaster and stucco systems, siding and tile) shall include the sealing of all joints, edges and corners with suitable materials. Penetrations of walls and ceilings serving electrical outlets, switches and fixtures, heating and cooling duct registers, plumbing and heating pipes shall be sealed by collars, foam or other approved devices to prevent dust from lead-based painted surfaces escaping enclosed surfaces. All sealing materials shall have an expected service life of a minimum of twenty years.

e. Enclosing systems shall leave interior space dimensions, areas and ceiling heights sufficient to meet all building codes and minimum property standards. Exterior enclosure systems shall permit structures to meet zoning restriction for set back requirements.

f. For enclosure systems which do not produce an air-tight enclosure such as plaster and stucco systems with control joints, wood paneling, and aluminum and vinyl siding, the

covering of the surface by a breathable wrap such as Tyvek® should be required to prevent lead-containing dust particles from migrating. Where breathable cloth is used to enclose existing wall surfaces, required ventilation strips and openings shall not be covered but shall remain open.

1. Gypsum Board Applied Directly to Existing Walls or Ceiling Surfaces

Enclosure of lead-based paint on gypsum board or plaster surfaces may be achieved by application of ¼" or 3/8" thick standard gypsum board directly to existing walls and ceilings. Gypsum board with tapered edges shall be attached with drywall screws or a combination of screws and construction adhesive. If quarter inch thick drywall is used, the surface to be enclosed must be essentially free of holes.

Screws shall be of sufficient length to pass through the existing drywall or plaster and intrude into the structural wood studs or ceiling joist 5/8" - 3/4".

Finishing materials including joint tape, corner and edge beading and spackle shall be as approved by gypsum board manufacturers and installed in accordance with their recommendations.

In high moisture areas, such as laundries and baths, moisture-resistant gypsum board shall be used. In bathtub or shower enclosures to be covered by tile, cement board shall be used.

All joints, corners, and edges and all surface penetrations for electrical outlets, switches, light fixtures, pipes and duct grilles and registers shall be sealed by means of collars, foam, or other approved devices to prevent dust from lead-contaminated surfaces from reaching newly enclosed areas.

Gypsum board shall be applied in accordance with the General Notes.

2. Gypsum Board Applied to Furring Strips

Where existing plaster or gypsum board surfaces are not suitable for direct application, a new layer of gypsum board may be applied over furring strips. Furring may be designated where the surface is uneven or has deteriorated or to cover existing surface moldings.

Furring may be wood 1" x 2" strips or metal channels shimmed as required to produce a true and even surface. Resilient metal channels may be used where additional sound attenuation is desired. The thickness of gypsum board shall be a minimum of ½" and spacing of furring shall meet industry standards.

Furring shall be anchored to structural studs, ceiling joists or roof rafters not more than 16" on center preferably with annular ringed nails penetrating the members approximately ¾".

Gypsum board panels shall be applied to furring strips as described in Section 1 and in accordance with the General Notes.

3. Lath and Plaster Applied Directly to Existing Wall and Ceiling Surfaces

Where existing wall and ceiling surfaces are sound and even, enclosure may be achieved by application of expanded metal lath or gypsum lath and required base and finish plaster coats. Selection of a plaster system depends on the desired surface and finish characteristics such as a smooth, sanded, hard or moisture resistant. Plasters may be job-mixed or ready-mixed systems as needed to satisfy the requirement of the job. Job-mixed plasters include lime plasters, sand gauging plasters, and Keenes cement.

Lath systems include gypsum lath and a variety of metal laths. Gypsum lath is usually available in sheets 16" x 48". Lath shall be applied as described in the General Notes.

4. Lath and Plaster Applied Over Furring strips

Where instability or unevenness of the existing surface requires, furring shall be installed prior to application of lath and plaster.

Furring may be 1" x 2" x 2" x 2" wood strips, metal hat-shaped channels, resilient metal channels or plaster lath strips. Anchorage of furring shall be to structural members, studs, joists or rafters by suitable nails, screws or other devices as described in the General Notes.

Lath may be gypsum lath, 16" x 48", or expanded metal or ribbed metal.

As an alternative to a conventional 3-coat plaster system, a veneer system of one or two veneer coats to a thickness of 1/16" to 1/8" may be used. Veneer plaster is applied to a specially prepared gypsum baseboard.

For spaces where high-moisture is expected, such as steam rooms or swimming pool enclosures, Keenes cement lime-sand plaster is recommended. Edges, corners, joints, and spaces around openings for electrical, plumbing and heating devices shall be properly sealed by materials with a life-expectancy of not less than 20 years from the passage of dust particles.

Application shall also be in accordance with the General Notes.

5. Stucco and Metal Lath Applied Directly in Wall and Ceiling Surfaces

Where greater surface durability, water resistance, variety of texture or integral color is desired, stucco systems may be used in place of gypsum plaster. When used as a lead-based paint enclosure system, stucco - a wet mixture of portland cement and lime - is trowel or spray applied to anchored expanded metal lath to produce a complete seal of wall or ceiling surfaces.

Stucco may also be used to enclose lead-based paint surfaces over expanded metal lath or over rigid foam board. The latter systems using polymer-based or polymer-modified plasters are spray or trowel applied to insulation board to which a mesh reinforcement has been attached. These systems are known as Exterior Insulation Finish (EIF) and should be installed in accordance with recommendations of the Exterior Insulation Manufacturers Association (EIMA). In order to prevent lead-contaminated dust from leaving the surface and migrating through control joints a breathable wrap material such as Tyvek® may be required.

All stucco systems for interior or exterior lead-based paint enclosures shall provide control joints to prevent surface cracking. Other recommendations in General Notes shall also apply.

6. Stucco Applied to Metal Lath on Furring Strips

Stucco may be used to cover lead-based paint on interior walls and ceilings and exterior surfaces of many construction systems where the condition of the substrate requires furring strips for adequate anchorage of the lath.

Stucco, usually applied to lath in three coats - scratch, brown, and a finish coat - produces a highly water-resistant surface. Finish coats are available in a variety of textures and colors.

Lath for stucco is available in expanded metal, ribbed and self-furring lath. Accessories for control joints, reinforcing and corner beads are available.

Furring may be wood, 1" x 2" or 2" x 2" strips or metal hat-shaped channels. Rigid foam board for EIF systems may also be used.

Recommendations included in General Notes should be followed for stucco systems.

7. Plywood Paneling Applied Directly to Existing Wall and Ceiling Surfaces

Prefinished plywood panels or panels to be finished after installation, usually ¼" thick, may be installed to walls and possibly to ceiling surfaces where the condition of the surface is suitable for application using annular-ringed nails and construction adhesive.

Care must be exercised in sealing all joints and edges to prevent passage of lead-containing dust particles. Non-hardening sealants such as silicone or urethane having a minimum 20 year life expectancy must be used for this purpose.

Lead-painted exterior surfaces may be enclosed with plywood panels such as Texture 1-11 or other plywood sheets, usually 5/8" to ¾" thick. Application of these panels directly to existing surfaces requires anchorage to structural members using suitable nails or a combination of nails and construction adhesive. Passage of lead-containing dust must be prevented by sealing all edges and joints by suitable sealants and where necessary a surface wrap with a breathable cloth such as Tyvek®.

Additional recommendations listed under General Notes should also be followed.

8. Plywood Paneling Applied Over Furring Strips

Where plywood is used to enclose lead-based painted surfaces, which are unsuitable for direct attachment of plywood, furring strips, shimmed as required, may be used to provide a sound, level base to which plywood may be secured.

Wood furring, usually 1" x 2" or 2" x 2" strips, 16" to 24" on center is securely anchored using nails or screws to exiting structural members or by means of masonry anchors, nails or toggle bolts to brick or masonry block walls.

All edges and corners of plywood panels must be sealed and surfaces wrapped where required to prevent dust migration. Other appropriate recommendations listed under General Notes must also be followed.

9. Solid Board Paneling Applied Directly to Wall or Ceiling Surfaces

Solid board paneling may be used to enclose lead-based painted interior wall and ceiling surfaces and exterior wall surfaces by application directly to suitable substrates.

Interior paneling may be unfinished or prefinished softwoods such as cedar, cypress, redwood, fir, and pine and hardwoods such as oak, elm, ash, fruitwoods, maple and walnut.

Exterior woods are usually the more insect-resistant woods such as cedar, cypress and redwood.

Most solid wood paneling is finished with tongue and groove or shiplapped edges for horizontal or vertical application or with interlocking edges, tapered for horizontal application. Some particle board material for horizontal application is also manufactured. Wood shingles, usually cedar, may also be used for exterior enclosure. Anchoring devices may be suitable nails or staples often used with a construction adhesive.

For most systems a breathable cloth wrap, such as Tyvek® is recommended as are other General Note suggestions.

10. Solid Board Paneling Applied Over Furring Strips

Where the condition of the surface to be enclosed lacks stability or evenness, the solid board paneling materials, minimum thickness of 5/8", as described in Section 9 above, may be installed over furring strips shimmed to produce an even, stable surface.

Furring may be wood 1" x 2" or 2" x 2" strips applied horizontally to accommodate vertical paneling or vertically to accommodate horizontal paneling. A wrap of the lead-based painted surface is usually required prior to installing furring. A breathable plastic cloth such as Tyvek® is used as wrap material to prevent lead-contaminated dust particles from migrating. Application shall also be in accordance with the General Notes.

11. Extruded or Shaped Sheet Metal over Existing Trim

In some construction situations, door and window frames and trim containing lead-based paint may be enclosed by the use of extruded vinyl shapes more cost effectively than removal and replacement of the in-place trim. Enclosure of the existing trim surfaces must completely seal all edges, corners and joints of the new trim covers with sealants such as silicone or urethane having a life expectancy of at least 20 years. Attachment may be accomplished by suitable nails, screws or clips and construction adhesive.

12. Ceramic Tile Applied in "Thin-Set" Mastic Directly to Existing Surfaces

Where condition of existing walls or floors allows, ceramic tile may be applied by "thin-set" method to surfaces containing lead-based paint to be enclosed. Tile should be pressed into a full-covering layer of mastic and allowed to set before applying grout to all surface joints. Sufficient grout shall be used to fill all spaces around and between tiles.

13. Ceramic Tile Applied in Mud Coat to Lath Directly to Existing Surfaces

Where it is desired to set ceramic tile in a mud coat, expanded metal lath or cement board lath is applied to existing lead-based painted surfaces. Tile is then set in a mud coat to the lath, allowed to set and then grouted with full joint grout. General Notes requirements also apply.

14. Ceramic Tile Applied in "Thin-Set" Mastic Over Furring

Where the surface of existing lead-based painted walls requires furring to achieve a sound, level support for application of ceramic tile, a cement board panel may be anchored to wood strip, metal channel or cement board strips shimmed as required. Ceramic tile is then set in mastic on the furred cement board base. After the mastic has set up, all edges and joints between the tile are grouted with grout forming a full joint in all voids. General Notes requirements also apply.

15. Ceramic Tile Applied in "Mud Coat" Over Furring

Ceramic tile to be used for enclosing lead-based painted surfaces may require a "mud coat" setting bed on a furred base. This may be especially true of the less precise hand-formed floor tile which requires a thicker setting bed permitting adjustments to produce an even floor.

On walls, metal lath or cement board lath may be attached to furring as a base for mud-coat setting bed. Furring should be shimmed as required to produce a level base for tile.

On floors, cement board, furred or shimmed as required to produce a true and level surface, is a suitable based for a "mud coat" application. General Note requirements apply.

After the tile has set, joints are grouted with suitable joint materials. Ceramic tile on floors requires a sand-mixed grout to produce a strong joint.

16. Brick Veneer Used to Enclose Lead-Based Painted Surfaces

A single width of brick may be applied as a brick veneer to enclose lead-based painted surfaces on both interior and exterior surfaces.

The first course of brick must be provided with the adequate structural support of a beam or steel shelf angle designed and attached to carry the load of the brick veneer wall without excessive deflection. The brick shall be laid in full beds or mortar, with full head joints attached to existing walls by suitable galvanized or stainless anchors imbedded in masonry joints, 24" on center, vertically and horizontally. All joints shall be tooled to produce a dense mortar joint.

At returns to frames, jambs, heads and sills of window and door openings, provision shall be made to seal existing surfaces from dust migration. A wrap cloth of breathable material such as Tyvek® may be required on exterior walls, especially where weep holes are provided to control moisture which has penetrated brick surfaces.

All building code room size and area requirements and exterior set-back restrictions must not be violated by the addition of the brick veneer.

17. Masonry Block Veneers Used to Enclose Lead-Based Painted Walls

A nominal 4" concrete masonry veneer may be applied to enclose lead-based painted surfaces on both interior and exterior wall surfaces.

All requirements listed above for brick veneer including structural support, anchorage to existing structure, treatment of joints and sealing of voids and joints shall also apply as shall requirements of codes and zoning.

18. Underlayment Grade Plywood, Oriented Strand Board or Particle Board Applied Over Existing Flooring

Underlayment grade plywood, oriented strand board or particle board, nominal thickness of ¼" may be used to enclose lead-based painted wood floors. The underlayment should be applied just prior to the finish material and should be protected from damage its surface. Panel end joints should be staggered with respect to each other, and all joints should be offset with respect to joints in the subfloor. Panel edges and ends should be butted to a close but not tight fit (1/32" space). Panels should be nailed 6" along edges and 8" on center each way throughout the remainder with 3d annular-ringed nails or 16 gauge staples, 3" on center along edges and 6" on center throughout. End joints shall be filled and thoroughly sanded.

Underlayment is suitable as a base for resilient tile such as rubber, vinyl and cork, sheet flooring and carpeting usually with a pad. It may also be used as a base for think, mastic-set strip or parquet wood finish systems.

19. Vinyl Siding

Prefinished vinyl siding, having a life expectancy of at least 20 years, may be installed over a variety of existing exterior wall surfaces to enclose lead-based paint. Installation of a building wrap system using breathable cloth such as Tyvek® and sealing all joints with silicone or urethane sealers should be used to ensure that dust particles cannot migrate through the vinyl siding system.

All siding panels, components and trim shall be installed in accordance with manufacturer's recommendations using appropriate fastening devices for proper anchorage.

20. Aluminum Siding

Prefinished aluminum, siding having a life expectancy of at least 20 years, may be installed over a variety of existing exterior wall surfaces to enclose lead-based painted surfaces. Siding installation application recommendations are similar to those for vinyl siding in Section 19 above.

Anchorage of all siding panels, trim and components for aluminum siding shall employ the use of aluminum nails. All siding panels, components and trim shall be installed in accordance with manufacturer's recommendations using appropriate fastening devices for proper anchorage.

Appendix 7.3:
Lead-Based Paint Abatement Specification Example

The following is an example of a detailed specification for lead-based paint abatement work in a large multifamily public housing development. Because all specifications are site-specific, its provisions may not be suitable for other situations. This level of detail may not be appropriate for all lead-based paint hazard control work.

This specification has been provided by Mr. Neal Freuden of EnviroScience Consultants, Inc., its chief author. It was formulated over the course of several projects and includes contributions from Fred Eberle of Dewberry and Davis, the staffs of the Cambridge, Massachusetts Housing Authority and the Dover, New Hampshire Housing Authority, the staff of Housing Environmental Services, Dennison Environmental, Dan LaBrie of the Housing Authority Risk Retention Group and Dave Jacobs. A model specification may be available from the National Institute for Building Sciences in the future.

PART 1 - GENERAL

1.01 SUMMARY OF WORK

A. The work under the contract consists of the following:

1. Exterior lead abatement and comprehensive modernization consisting in total of xxx existing occupied units in _____ buildings.

2. Removal of all windows, sashes and window systems, exterior doors and door casings/ jambs and installation of new replacement windows and doors and door casings/jambs as indicated in the specifications and drawings. All removal and installation shall be performed and coordinated as indicated in the specifications and drawings.

3. Exterior Lead Paint Abatement by component removal as indicated in the specifications and drawings. All abatement work shall be coordinated with the general Construction Work and as indicated in the specifications and drawings.

4. Replacement of components removed under lead abatement.

5. Installation of wood clapboard and wood shingle siding and replacement of exterior building components as indicated in the specifications and drawings.

6. Creation of handicapped accessible entries to certain designated units.

7. All other work and items either shown on the drawings or included in the specifications.

8. Protection where appropriate of all temporary facilities and utilities and property outside the designated work areas and zones.

9. Maintaining existing occupancy and use: Except as indicated in the specifications, work of the project includes keeping all occupied buildings and units in full complete year round operation. Work of the project includes providing all temporary facilities and utilities needed to insure that occupied units are safely accessible and supplied with electricity, water, sewers, heat, telephone service and other utilities which may currently be present. Occupancy will remain in all units.

10. The Contractor shall be responsible for all means and methods required to perform the work in accordance with the Contract Documents and within the time limits established in the Contract and this Section.

11. There will be a Pre-Bid Walk-through held at a time and place identified in the Bidding Documents. All general Bidders and Abatement Subcontractors should attend this Pre-Bid Walk-through to acquaint themselves with the existing conditions and required scope of work.

1.02 WORK INCLUDED

A. The requirements of this Section govern specific aspects of the administration of the Work. The Contractor is responsible for compliance of his own forces and of his subcontractors with the requirements in this Section.

B. The Contractor is responsible for all corrections of and changes in the Work, and for any delays resulting from his failure to conform with these requirements, and for all costs arising there from.

C. Individual requirements for work provided for under this Section are described in other Sections of the Specifications.

1.03 PERFORMANCE OF WORK

A. Work of the Lead Hazard Control Contractor: The Contractor or subcontractor to perform the following work shall be a Lead hazard control Contractor licensed to perform lead hazard control.

1. Removal of exterior unit components containing lead-based paint as identified in the Lead Paint Inspection Reports provided by Owner according to the specifications and drawings.

2. Removal of the exterior components containing lead-based paint as listed in Section X.

3. On-site stripping of the exterior components containing lead-based paint as listed in Section X.

4. All work performed by the Lead hazard control Subcontractor shall be in accordance with applicable federal and state and local regulations and the specifications and drawings.

B. Work of the General Contractor: All other work described in these specifications shall be performed according to applicable codes and standards, federal, state and local regulations and the specifications and drawings.

1.04 PILOT BUILDINGS

A. Except as provided herein, all materials used on the Sample Buildings shall conform to the Contract Documents and shall have been submitted to and approved by the Architect in accordance with Section X of the Specifications. Where submittals of materials have been made to the Architect but have not been approved, the Contractor may request approval to employ such materials in the Sample Buildings at its own risk and the Architect may permit such use on condition that if any material is later disapproved it shall be removed and replaced with approved material.

In the case of equipment and material which have long lead times for delivery, the Architect may accept the use of the "mock-up" construction simulating the appearance of the completed work upon the condition that as soon as the actual materials and equipment become available the contractor shall promptly install these items in place of the simulations, at no additional cost to the Owner.

B. Upon acceptance of the Sample Buildings by the Owner, Architect, and Consultant, the quality of finish and details thereon shall constitute the minimum level of acceptable workmanship for all other buildings throughout the site. The Contractor shall provide adequate maintenance and security for the Sample Buildings from the start of work thereon until the time of final acceptance by the Owner or until such earlier time as may be established in writing by the Owner. The Sample Buildings will be re-occupied by project residents upon completion.

1.05 EXISTING SITE CONDITIONS

A. Existence of Lead-Based Paint

1. All Buildings under this Contract have lead-based paint identified on the exterior components, noted herein.

2. Lead-based paint is either known or assumed to exist on the following components considered for the purposes of this project to be on the exterior of the units:

a. Front and back doors - exterior side
b. Front and back exterior door jambs, casings, and flashing
c. Window troughs, sashes, stops, mullions, casings, headers, and flashing
d. Basement windows
e. Exterior wood siding, trim, soffit and thresholds, molding, skirt
f. Electrical conduit
g. Roof rakeboard and other exterior painted wood components as shown on the drawings
h. Roof drainage system components
i. Bulkheads

j. Brick and Concrete surfaces
k. Exterior railings, guards and balusters
l. Attic vents

B. All renovation activities to remove or strip the components on the exterior of these units shall be performed according to all lead abatement procedures of the specifications and drawings and federal, state and local regulations.

C. It is the intent of the Contract Documents to include the abatement of all exterior components with lead-based paint. Nothing shall be charged back to the Owner for the Contractor's failure to include removal and disposal of all items under the Base Bid and any applicable Add Alternates.

1.06 DEFINITIONS

A. Applicable provisions of the General Conditions and Supplementary Conditions of the Contractor and General Requirements are given in this Section. For the purposes of these Specifications and the Contract:

1. "Owner" shall refer to the owner and its designated, authorized representatives.

2. "Funding Source" shall refer to _____

3. "Contractor" as used in these Contract Documents refers to the General Contractor for the Work under contract with Owner.

4. "Lead Hazard Control Subcontractor" shall refer to the Licensed Lead hazard control Contractor.

5. "Environmental Consultant" shall refer to _____

6. "Architect" and "Landscape Architect" shall refer _____

7. "Inspector" shall refer to the on-site licensed lead inspector as employed.

8. "Product" as used in these Contract Documents refers to materials, systems and equipment provided by the Contractor or Subcontractor.

9. "Project Manual" as used in these Contract Documents includes bidding requirements, Conditions of Contract, and Specifications.

10. "Family Unit" as used in these Contract Documents refers to dwelling units known by Owner to be occupied by at least one child under the age of six years at the time of the Contract.

11. The words "shall" or "will" means "must" as used in these Contact Documents.

B. If the Lead Hazard Control Abatement Subcontractor is the General Contractor, the use of the term "Contractor" shall also refer to the "Lead Hazard Control Abatement Subcontractor". If the Lead Hazard Control Abatement Subcontractor is a subcontractor

of the General Contractor, the General Contractor shall oversee and be responsible for the work of the Lead Hazard Control Abatement Subcontractor as stated in the drawings and specifications.

C. Owner has retained the Consultant for the purposes of project management during Lead-Based Paint Abatement. The Consultant will represent the Owner in all phases of the lead-based paint abatement project at the discretion of the Owner. The Lead Hazard Control Abatement Subcontractor will regard Consultant's direction as authoritative and binding as provided herein, in matters particularly but not limited to approval of work areas, review of monitoring results, completion of the various segments of work, final completion of the lead-based paint abatement, submission of data, and daily field punchlist items.

1.07 TENANT COORDINATOR

A. Contractor shall employ, for the duration of the Contract, one Tenant Coordinator who resides at the Development. This Tenant Coordinator shall serve as the contact person between the occupants of the Developments and the Contractor, and shall assist in the coordination of the scheduling.

B. The Owner shall review and approve of the person proposed for employment as the Tenant Coordinator.

C. The Contractor shall pay the Tenant Coordinator for time not to exceed 40 hours per week and shall pay him/her a minimum of $12.00 per hour. This hourly pay rate shall include all insurance and benefits as required by the Owner.

D. The Contractor shall employ the Tenant Coordinator for the time period from the initiation of the Contract to the completion of the Contract. It is estimated that the duration of the Contract will be approximately ten (10) months, or as the Contract Time is specified elsewhere in the bid documents.

E. The cost of the Tenant Coordinator shall be included in the Contract Price. There shall be no additional cost to the Owner for the Tenant Coordinator.

1.08 USE OF THE CONTRACT DOCUMENTS

A. It has been indicated on the Drawings and in the Specifications what existing items are to be removed, what are to remain, and what new work is required to fulfill the intent of the Contract Documents. It shall be incumbent upon the Contractor to visit the Site and determine existing conditions and what will be required to accomplish the Work intended by the Contract Documents. No increase in the Contract Sum will be permitted as a result of the Contractor's failure to accomplish any or all of the above requirements.

B. An attempt has been made to identify all work related under each Section of the Specifications. It is the Contractor's responsibility to coordinate with all trades involved irrespective of whether the same are listed under "Related Work".

C. All work shall comply with the Contract Documents and with all applicable Codes, laws, regulations, and ordinances wherever applicable. The most stringent of all the foregoing shall govern.

D. It is not intended that the Drawings and Specifications show every detail of the Work, but the Contractor shall be required to furnish within the Contract Sum all material and labor necessary for the completion of the Work in accordance with the intent of the Drawings and Specifications.

E. In case of ambiguity between any of the Contract Documents, the better quality and/or the greater number will be required.

F. The Drawings are to be understood as diagrammatic and are not intended to be rigid in details where such detail may be in conflict with the recommendations of the manufacturers of equipment to be installed or the requirements of the Work. The Work of this Contract includes making such modifications as may be necessary, subject to approval by the Architect, Consultant, and Owner, to correct such conflicts.

G. Equipment and materials specified herein shall be furnished complete with all features normally provided with such items and any features or accessories required by the special conditions of the Work thereunder performed, whether or not specified or drawn in complete detail. Such equipment or materials shall be subject to the approval of the Architect, and shall in all cases be suited to the purpose for which it is intended and shall bear guarantees and certifications as specified herein or required by law regardless of the manufacturer's standard practice.

H. General Notes appearing on the Drawings are hereby made part of these Specifications. Conflicts between these notes and the Specifications shall be resolved in accordance with the General Conditions, as amended.

I. Drawings shall not be scaled. Field verification is required, since actual conditions may vary from recorded data.

J. Should the Drawings not agree in themselves or not agree with the Specifications, the greater quantity or superior quality of work or materials shall be estimated upon and included in the bid price. The Contractor shall call such discrepancies to the attention of the Architect as soon as they are noted.

K. All items, not specifically mentioned in the Specifications or noted in the Drawings but implied by trade practices to form part of the complete installation, shall be included.

1.09 EXAMINATION OF THE SITE

A. It is understood that the Contractor has examined the Site and made his own estimates of the facilities and difficulties attending the execution of the Work, and has based his price thereon.

B. Except for unforeseeable concealed conditions as determined by the Architect or Consultant, the Contractor shall make no claim for additional cost due to the existing conditions at the site, which, in the opinion of the Architect, with reasonable diligence could have been ascertained by the Contractor in his examination of the Site.

C. In the case of certain materials and work where quantities are not precisely established, the use of Allowances and Unit Prices is intended to establish a cost basis for a certain quantity of work and variations therefrom.

1.10 CONSTRUCTION PROGRESS SCHEDULE

A. To assure adequate planning and execution of the Work, and to assist the Architect and Consultants in appraising the reasonableness of the Contractor's applications for payment, the Contractor shall prepare and maintain a detailed Progress Schedule. This schedule shall be prepared by the Contractor in accordance with requirements stated in Section xxx Scheduling and Phasing of this Specification and be approved by the Architect and Owner prior to the commencement of any work on this project.

B. Schedule of work of this Contract shall include the notification requirement of 5 days prior notification to tenants and regulatory agencies for the work of Section 02080 and 02090 and other related sections. This notice shall be given individually for each apartment and shall not be given all at one time for all the apartments, but a maximum of seven (7) days prior to the start of the work at each apartment.

C. The Contractor shall supervise and direct the work of his and other trades using his best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the work under the Contract.

1.11 TESTING LABORATORY SERVICES

A. Product testing shall meet current UL standards. Contractor shall submit to the Architect the product data as required by Section 01300 or employ a testing laboratory to perform product testing to confirm the use of acceptable materials and methods.

B. Refer to Section XX for testing and analysis of waste generated during the work of this and related sections.

1.12 RUBBISH AND WASTE MATERIAL

A. All rubbish and waste material from the Work shall be neatly stacked or kept in suitable containers and removed regularly from the premises. The premises shall be kept clean and in an orderly condition at all times to the reasonable satisfaction of the Owner, the Consultant and Architect.

B. Frequency of removal shall be made satisfactory to the Architect, Consultant and the Owner. At no time shall waste be removed from the site without the following documentation submitted for approval by Consultant:

1. Waste manifest, as waste is generated and contained for disposal.

2. TCLP Testing results, as required by the specification.

3. Clerk sign-off of a copy of the manifest.

1.13 DELIVERY AND STORAGE

A. Materials for all trades shall be delivered to the job site in manufacturer's original unopened containers with manufacturer's brand name clearly marked thereon.

B. Contractor shall handle and store materials carefully in accordance with manufacturer's recommendations and protect them from moisture and extremes of heat and cold.

C. Copies of Purchase Orders, Shipping Manifests and Bills of Lading shall be available to the Architect and Owner upon request.

1.14 SUBSTANTIAL COMPLETION

A. Interim Substantial Completion dates will be declared according to the following schedule:

1. For work on the exterior of each building, including installation of new materials, as well as any required patching or work on the interior of any unit in that building Interim Substantial Completion will be declared upon completion of the work at each building.

2. For work of this contract, Substantial Completion will be declared upon completion of the entire work of the Contract.

B. In order for an Interim Substantial Completion date to be declared, the applicable submittal requirements of Section XX shall have been met.

C. At the conclusion of the Project, a Final Substantial Completion date will be declared which will constitute acceptance of the project as a whole and which must be achieved within the time allotted for the work of this Contract.

1.15 CLOSE-OUT AND PUNCHLIST

A. Refer to Section XX for additional close-out requirements.

B. The Contractor shall carefully check his own work and that of Subcontractors as the work is being performed. Unsatisfactory work shall be corrected immediately.

C. During the finishing stages of the Project, the Contractor shall make frequent inspections with Subcontractors and the Architect, Project Inspector, Project Monitor, and/or Clerk-of-the-Works (Project Representative) to progressively check for and correct faulty work.

D. When the Contractor determines that the work is substantially complete, that is, has less than one percent of his Contract remaining to be completed, he shall prepare for submissions to the Architect a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to

complete all work in accordance with the Contract Documents.

E. Upon receipt of the Contractor's list of items to be completed or corrected, the Architect and/or Clerk will promptly make a thorough inspection and prepare a "punchlist", setting forth in accurate detail any items on the Contractor's list and any additional items that are not acceptable.

F. When the "punchlist" has been prepared, the Architect and/or Clerk will arrange a meeting with the Contractor and Subcontractor to identify and explain all punchlist items and answer questions on the work which must be done before final acceptance.

G. If the Contractor gives notice that a Subcontractor has completed his "punchlist" items, the Architect and/or Clerk shall inspect that portion of the work, and, if the items are found to be satisfactorily completed, advise the Contractor accordingly.

H. The General Contractor shall correct all "punchlist" items or shall cause the correction of the "punchlist" items within a time frame to be established when the "punchlist" is made. The time frame for the completion of the "punchlist" shall not exceed the completion date phase of the Contract as agreed to in the project scheduling. Should the "punchlist" not be completed within the specified time frame, the Owner may invoke the rights given under the General Conditions.

I. The Architect shall not be expected to inspect any building more than once to inspect for the preparation of the "punchlist" items, or if fifteen or more distinct deficiencies are discovered by the Architect during such inspections. If, during an inspection under this Paragraph, the Architect does discover fifteen deficient conditions at the building, then the building shall be declared Not Ready for Inspection.

J. For all work associated with each building, all punchlist items shall be complete prior to declaration of Interim Substantial Completion and full-time reoccupancy of the units.

K. All inspections required for lead hazard control compliance will be performed by the Project Monitor and Project Inspector respectively.

1.16 CLEANING

A. Throughout the construction period, maintain the building and site free of rubbish, debris, surplus materials, and other items not required for the construction of the Work. Remove such materials from the site regularly to prevent accumulations. Remove all construction debris from work areas, and remove all hazardous items as required by the most current federal, state and local regulations and the requirements of the specifications. In areas where finish work is being conducted, remove dust, dirt and other matter as required to provide safe and proper working conditions.

B. Final Site Cleaning - At the time of the Architect's inspection for Substantial Completion, all materials, surfaces, and finishes shall be completely clean to the satisfaction of the Architect. The completed structures shall be left thoroughly clean and ready for

occupancy as described in Section XX.

C. Final Unit Cleaning shall occur as described in Section XX. Cleaning activities required for lead hazard control abatement, and selective demolition shall be performed in accordance with the most current federal, state and local regulations and these specifications.

1.17 SETS OF DOCUMENTS FURNISHED

A. In addition to the executed set of Contract Documents, the Owner will furnish six (6) sets of prints of the Contract Documents. The Owner may, on request of the Contractor, provide other sets of the Contract Documents used in the bidding for use of the Contractor on condition that the Contractor shall accept these sets as is, without warrantee from the Owner, and that any marking or notations found on these sets shall have no meaning. The Contractor shall also make arrangements with the Architect to secure and to pay for one set of "wash-off mylar" reproducible Drawings from which the Contractor may make additional prints, at its expense, and which will be used for the Record Documents in accordance with this Section.

B. Contractor will receive a copy of the Lead Paint Inspection reports for the units tested.

C. Contractor will receive a copy of the Asbestos Containing Material Report for the units tested.

1.18 WEEKLY CONSTRUCTION MEETINGS

A. Contractor shall attend weekly project construction meetings throughout the project, to be held at a time convenient to Owner and Contractor.

B. Consultant and/or Architect and Clerk will attend weekly meetings and record the information discussed. Meeting notes will be produced and distributed to all attendees.

C. Contractor shall review and submit, in writing, comments to the Clerk on any disagreements with items or statements in the meeting notes, within five (5) days of the receipt of the meeting notes. The Architect and/or Consultant will review and make changes as applicable.

D. Meeting notes will be made part of the permanent record for the project. Any clarification or changes in the intent or interpretation of the specification documents will be made in writing as discussed in the construction meeting.

E. The following personnel shall attend all construction meetings:

1. General Contractor’s Superintendent
2. Lead Hazard Control Subcontractor’s Supervisor
3. Tenant Coordinator

F. Representatives of any subcontractors shall attend the weekly construction meetings as requested by the Architect and Owner.

1.19 ADDITIONAL GENERAL REQUIREMENTS

A. The Contractor shall employ a competent individual with at least five years rehabilitation experience on similar building types as superintendent who shall be in responsible charge of the work and have full time daily supervision of same.

B. The Lead Hazard Control Subcontractor shall employ a competent Licensed Supervisor with at least three years lead hazard control supervisory experience on projects of similar scope and magnitude who shall be responsible for all work involving lead-based paint abatement as described in the specifications and defined in applicable regulations, and have full-time daily supervision of the same.

C. The Contractor shall allow the work of this contract to be inspected if required by local, state, federal and any other authorities having jurisdiction over such work. Contractor shall immediately notify Owner and Architect and shall maintain written evidence of such inspection for review by the Architect, Consultant and Owner.

D. The Contractor shall obtain the approval of the local fire department, if necessary, for all finish materials, and the use of lead hazard control work area isolation materials.

E. The Contractor shall incur the cost of all fines resulting from regulatory non-compliance as issued by federal, state, and local agencies. Contractor shall incur the cost of all work requirements mandated by federal, state, and local agencies as a result of regulatory noncompliance or negligence.

F. The Contractor shall immediately notify the Consultant and Architect of the delivery of all permits, license, certificates of inspection, of approval, of occupancy, etc., and any other such instruments required under codes by authorities having jurisdiction, regardless of to whom issued, and shall cause them to be displayed to the Consultant and Architect for verification and recording.

G. The Contractor shall submit all drawings, samples, product information, testing results, and all other submittals and information required by the Contract to the Architect who will process the submittals for Consultant, Architect and Owner approval.

H. The Contractor shall supply to the Owner Record Drawings as described in Section XXX.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide and maintain all services, materials, equipment and labor required for the Work of this Section.

B. Comply with all applicable requirements of the Specifications for materials and assemblies required for Work of this Section.

C. Construction and materials required for the Work of this Section and not provided for in

the Specifications shall be made acceptable to the Architect and Consultant.

D. Remove from the site all materials and supplies provided in this Section when no longer required.

E. If requested by the Consultant or Architect, submit Record Drawings or Product Data, as applicable, for products used in the work of this Section in accordance with section XX.

END GENERAL CONDITIONS
LEAD-BASED PAINT ABATEMENT SPECIFICATIONS

PART 1 GENERAL

1.0 GENERAL PROVISIONS

A. Attention is directed to the Contract and General Conditions and all Sections within Division 1, General Requirements, which are hereby made a part of this Section of the Specifications.

B. Time, Manner, and Requirements for Submitting Sub-Bids:

1. Sub-Bids for Work under this Section shall be for the complete Work and shall be filed in a sealed envelope with the Owner at a time and place as stipulated in the Notice to Contractors.

   The following shall appear on the upper left-hand corner of the envelope:

   NAME OF BIDDER: _____
   SUB-BID FOR SECTION: Lead Based Paint Abatement

2. Each Sub-Bid submitted for Work under this section shall be on forms furnished by the Owner as required by local law or federal regulations. Sub-Bid forms may be obtained at the office of the Owner, or may be obtained by written or telephone request.

3. Sub-Bids filed with the Owner shall be accompanied by Bid Bond or Cash or Certified Check or a Treasurer's or Cashier's Check issued by a responsible bank or trust company payable to the Owner in the amount of Five Percent (5%) of the Bid. A Sub-Bid accompanied by any other form of Bid Deposit than those specified will be rejected.

C. Reference to Drawings: Work to be performed is shown on Drawings.

1.1 SCOPE OF WORK

A. Summary. Work outlined includes the complete abatement of all exterior lead-based painted building components on xx residential buildings located at the xxx housing site, Any Town, USA. Work is shown on the Hazardous Materials and Selective Demolition drawings. Abatement work is being performed as an integral portion of the overall exterior modernization (housing rehabilitation) of both sites. Strict coordination of all

general industry trades, as well as lead-based paint abatement and asbestos removal work will be extremely important.

Abatement work will include, but not be limited to, removal and disposal of exterior trim, windows, doors, canopies, porch lattice, electrical conduit, attic and roof vents, soffits and drainage components. Additional building components requiring abatement will include, but not be limited to, bulkheads, flashing and steel lintels at all masonry openings, porch railings and balusters, and round crawlspace vents. Lead-based paint abatement work will be integrated into the construction work and the asbestos removal work on all buildings.

Removal of lead-based paint-covered exterior trim components, windows, doors, canopies, and drainage components will be closely coordinated with the Asbestos Abatement Subcontractor. Abatement work is being performed as an integral portion of the overall exterior modernization of the sites. Strict coordination of all general industry trades, as well as all subtrades will be extremely important.

Abatement work will include, but not be limited to, removal and disposal of exterior clapboard and wood shingle siding and associated trim, windows, doors, canopies, porch lattice, electrical conduit, attic and roof vents, soffits and drainage components. Additional building components requiring abatement will include, but not be limited to, bulkheads, flashing and steel lintels at all masonry openings, porch railings and balusters, and round crawlspace vents.

1.1.1 Overview. This project is being carried out to eliminate hazards relating to the presence of lead-based paint. The work to be carried out, together with the steps to be taken to adequately protect the workers, assure a safe workplace, and provide for a safe adjoining environment are described in the following section.

1.1.2 Owner's Role. The performance and execution of the project shall be monitored by Owner or Owner's designated representative to ensure full compliance with these Specifications and applicable regulations. Owner will assume the cost associated with the independent laboratory and inspection work required in this Specification for the final clearance testing and random analyses as specifically noted.

1.1.3 Consultant's Authority. The Owner has retained an environmental consultant for the purposes of the management of the Lead-Based Paint Abatement described herein. The Consultant will represent the Owner in all phases of the lead-based paint abatement project at the discretion of the Owner. The Abatement Subcontractor will regard the Consultant's direction as authoritative and binding as provided herein, in matters particularly, but not limited to, the following:

A. Approval of work areas.
B. Review of monitoring results.
C. Completion of the various segments of work.
D. Final completion of lead-based paint abatement.

E. Submission of data.
F. Daily field punchlist items.

1.1.4 Division 1 applicability. The Conditions of the Contract and Division 1, General Requirements shall be part of this Section.

A. Document Review. Contractors shall examine all Drawings and all other Sections of the Specifications for requirements affecting the work of this Section. Questions on interpretations, omissions, and methods should be referred to the Owner.

1.2 GENERAL REQUIREMENTS

1.2.1 Definitions. Applicable provisions of the General Conditions and Supplementary Conditions of the Contract and General Requirements are given in this Section. For the purposes of this Section:

A. Abatement: Means any measure designed to permanently eliminate lead-based paint hazards in accordance with standards established by the EPA Administrator 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 (with a product that has been shown to meet standards established or recognized pursuant to Title IV of TSCA); 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 or sod, which are considered interim control measures); as well as all preparation, cleanup, disposal, post-abatement clearance testing, record-keeping, and monitoring (if applicable).

B. Abatement Area: Means the exterior of the building or an area isolated from the building interior by containment.

C. Accessible Surface: Means any surface which is below five (5) feet in height from the floor or ground or is exposed in such a way that a child can come in contact with the surface.

D. Biological Monitoring: Is the analysis of a person's blood to determine the level of lead contamination in the body. Biological monitoring for lead hazard reduction work includes blood sampling and analysis for lead and zinc protoporphyrin levels.

E. Certified Industrial Hygienist: Is a person certified by the American Board of Industrial Hygiene and who has at least four years experience and a graduate degree or five years experience; and who has passed a two-day examination offered by the Board (see also industrial hygienist).

F. Change Room: The area of a worker decontamination facility used for removing protective equipment prior to entering the clean room.

G. Clean Room: The area of a worker decontamination facility used for donning protective

equipment and storing street clothes.

H. Code Enforcement Agency: Means the State Lead Poisoning Prevention Program or its agent, or the local board of health or other agency responsible for enforcing the State Sanitary Code or sections thereof.

I. Commissioner: means the Commissioner of Public Health

J. Common Area: Means a room or area that is accessible to more than one tenant in a building (e.g., common hallways, stairwells, laundry rooms).

K. "Consultant": Shall refer to the Environmental Consultant, and its designated, authorized representatives.

L. Containment: Means a process for protecting other workers, residents, and the environment by isolating areas from exposures to lead dust and debris created during abatement in a work area.

M. Decontamination of Personnel: Shall include, at a minimum, HEPA vacuuming of disposable personal protective clothing according to the provisions in 29 CFR 1926.62.

N. Decontamination of Work Areas: Shall be as specified in Section 3.1.

O. Defective Surface: Means peeling, flaking, chalking, scaling, or chipping paint; or, paint over crumbling, cracking, or falling plaster, or plaster with holes in it; paint over a defective or deteriorating substrate; paint that is separating from the substrate; and paint that is damaged in any manner such that a child can be exposed to the paint from the damaged area.

P. Employee: Any person employed or hired by an employer in any lawful employment.

Q. Employer: Any person, firm, corporation, partnership, association, or other entity engaged in a business or providing services, including the State and any of its political subdivisions, or any person acting in the direct interest of any of the foregoing in relation to any employee or place of employment.

R. Elevated Blood Lead Level: In adult workers, means a blood lead concentration equal to or greater than twenty-five (25) micrograms per deciliter (µg/dl) or an increase of ten (10) µg/dl above baseline levels.

S. Enclosure: Means covering surfaces and sealing or caulking with durable materials so as to prevent or control chalking, peeling, or flaking substances containing toxic levels of lead from becoming part of house dust or accessible to children.

T. Entity: Means any person, partnership, firm, association, corporation, sole proprietorship, or any other business concern, state or local government agency or political subdivision or authority thereof, or any religious, social, or union organization, whether operated for profit or otherwise.

U. "General Trades Contractor": Shall refer to the contractor responsible for coordination of all filed sub-bids and general construction.

V. Hazardous Level of Lead for Waste Disposal: Is 5.0 parts per million (ppm) as defined by RCRA Toxicity Characteristic Leachate Procedure (TCLP) or other requirement set by local or state authorities.

W. High Efficiency Particulate Air (HEPA) Filter: Means a type of filtering system capable of filtering out particles of 0.3 microns or greater diameter from a body of air at 99.97% efficiency or greater.

X. High Phosphate Detergent: Is detergent which contains at least five percent (5%) tri-sodium phosphate (TSP) or other equally effective cleaning agent.

AA. Intact Surface: Means a defect-free surface with no loose, peeling, chipping, or flaking paint. Painted surfaces must be free from crumbling, cracking, or falling plaster and must not have holes in them. Intact surfaces are not damaged in any way.

BB. Lead-based: Refers to paints, glazes, and other surface coverings containing a toxic level of lead.

CC. "Owner": Shall refer to the Owner and its designated, authorized representatives.

DD. Paint Removal: Means a strategy of abatement which entails stripping lead paint from surfaces.

EE. Qualified Abatement Subcontractor: A sub-contractor capable of providing a properly trained and equipped work force for abatement work. All workers employees to perform abatement activities shall have successfully completed a minimum of 24 hours of training in the potential hazards of abating lead based paint. Abatement contractors must possess the appropriate license or certification from the State or local government.

FF. Removal: Means a strategy of abatement which entails the removal of components, such as windows, doors, and trim that contain toxic levels of lead such that new components which are lead free may be installed.

GG. "Subcontractor": Shall refer to the Abatement Contractor.

HH. Toxic Level of Lead in Surface Coatings: Is 1.0 milligrams or more per square centimeter (mg/cm^2) by XRF methods or 5,000 µg/g (0.5%) by laboratory testing, as defined in HUD Regulation and the Lead-Based Paint Poisoning Prevention Act.

II. Toxicity Characteristic Leachate Procedure (TCLP): Is the EPA required sample preparation for determining the hazard characteristic of a waste generated at a lead abatement site.

JJ. "Wet Wall": Shall refer to walls which contain plumbing fixtures and/or pipes, including both supply and sanitary lines;

1.3 APPLICABLE DOCUMENTS/REFERENCES

1.3.1 Safety Regulations. The following are some applicable Federal regulations:

Occupational Safety and Health Administration

29 CFR 1910	General Industry Standards
29 CFR 1910.1025	Lead Standard for General Industry
29 CFR 1910.134	Respiratory Protection
29 CFR 1910.1200	Hazard Communication
29 CFR 1910.245	Specifications for Accident Prevention (Sign and Tags)
29 CFR 1926	Construction Industry Standards
29 CFR 1926.62	Construction Industry Lead Standard

Environmental Protection Agency

40 CFR Part 261	United States Environmental Protection Agency Regulations

Department of Housing and Urban Development

24 CFR Parts 35, 36, 37	HUD Lead-Based Paint Regulations

HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing

1.3.2 Codes and Standards. All work shall conform to the standards set by applicable federal, state and local laws, regulations, ordinances, and guidelines in such form in which they exist at the time of the work on the contract and as may be required by subsequent regulations including the following:

A. ASTM - American Society for Testing Materials.

B. ANSI - American National Standards Institute.

1. ANSI Z288.2-8 Practices for Respiratory Protection

2. ANSI Z9.2 1979 Fundamentals Governing the Design and Operation of Local Exhaust Systems.

C. U.L. - Underwriters Laboratories, Inc.

1.3.3 Abatement Regulations and Guidelines. In addition to any detailed requirements of the Specifications, the Abatement Subcontractor shall, at his own cost and expense, comply with all laws, ordinances, rules, and regulations of federal, state, regional and local authorities regarding handling and storing of lead waste material. The Contractor and Subcontractor must also comply with the provisions of the HUD Guidelines for the Evaluation and Control and Lead-Based Paint Hazards in Housing

1.3.4. Abatement Subcontractor's Responsibility

A. All regulations by the above and other governing agencies in their most current version are applicable throughout this project. Where there is a conflict between this Specification

and the cited federal, state or local regulations or guidelines, the more restrictive or stringent requirements shall prevail. This Section refers to many requirements found in these references, but in no way is it intended to cite or reiterate all provisions therein or elsewhere. It is the Abatement Subcontractor's responsibility to know, understand, and abide by all such regulations, guidelines and common practices.

1.4 Abatement SUBCONTRACTOR

1.4.1 Qualification Criteria. The Owner requests that documentation be provided for all aspects of the work at the Bid opening detailing the firm's qualifications on the following criteria:

A. License Requirements. Firm(s) shall be qualified to perform abatement operations as defined by the HUD Guidelines and Local Law and have workers and supervisors who have successfully completed training courses covering abatement issues. This course shall cover all topics required by HUD, EPA and Local Law. These topics should include, but not be limited to, the following:

1. Toxicity of Lead
2. How Can I Protect Myself? (Respirators, Personal Protective Equipment and Decontamination Procedures)
3. Other Chemical and Safety Hazards
4. Using Tools
5. Completing the Project
6. Role of the Inspector
7. Lead in Construction and Abatement
8. Monitoring and Medical Removal
9. Signs and Labels
10. Preparing the Work Area
11. Cleanup: How and Why
12. Clearance
13. Worker Responsibilities

All Contractors are also advised that licenses in other trades may be required. The Subcontractors are responsible for insuring that all licensing requirements for appropriate trades and procedures are met.

B. Demonstrated Ability of Workers. Firm(s) must demonstrate that they have (or will have) a sufficient number of trained abatement workers who have successfully completed training in accordance with the topics listed above to complete all aspects of work covered in this Specification.

C. Previous Experience

1) Abatement Subcontractor. The Abatement Subcontractor for abatement must have successfully completed at least three abatement projects involving all requirements elements of abatement work, including worker protection, medical monitoring, work area preparation, clean-up and clearance, valued at a minimum of one hundred thousand dollars ($100,000.00) for each project.

2) Abatement Subcontractors. If a Subcontractor for caustic paste, needlegun and pre-fabricated metal window wraps or other subtask in the abatement process will be used, the Subcontractor must be identified by name and contract amount on the bid form. If the Abatement Subcontractor plans to do this work, the firm's name and amount must be entered on the bid form. If the General Contractor plans to do this work, the firm's name must be entered in on the bid form, but the contract amount must be left blank.

1.4.2 Insurance

The following insurance requirements may not be obtainable in all areas and may need to be relaxed depending on availability.

A. Prior to the start of work, the Abatement Subcontractor will secure and maintain, the following insurance.

Workers compensation and employers liability insurance subject to the laws of the state of _____. Such insurance shall include "All States and Voluntary endorsements as well as other endorsements that may be required by applicable jurisdictions.

Workers Compensation Limit	Statutory
Employers Liability Limit	$100,000/person

Abatement liability policy including completed operations liability. The completed operations liability will extend for a minimum period of five years beyond completion of the abatement work. The Abatement contractor will be issued an occurrence policy with a minimum limit of $500,000 per occurrence and $1,000,000 aggregate.

Commercial general liability insurance insuring bodily injury, personal injury, and property damage with a combined single limit of $500,000 each occurrence and $1,000,000 aggregate including contractual liability and contractors protective liability.

Automobile bodily and property damage liability insurance, covering all owned and non-owned automobiles, with a minimum of $500,000 combined single limit per accident. Such insurance shall include the transportation of any hazardous material generated from the abatement work.

B. The Abatement contractor shall required its insurer(s) to waive all rights of subrogation against the Owner, Project Manager, Consultant, Architect and Engineer and all other contractors and their directors, officers and employees with respect to work or operations in connection with this abatement project. The policy(ies) shall be endorsed to name the Owner, as additional insured with respect to claims or injury arising from the work or operations for this abatement project.

C. The Abatement Contractor shall, prior to commencement of work at this project, furnish evidence of the insurance required above to the Owner. The abatement Contractor shall also provide proof of workers compensation, employers liability automobile liability and abatement liability insurance covering the operations related to this project. The required

proof should be provided in the form of the ACCORD insurance certificate and the certificate shall provide for 30 days notice to the Owner of any material reduction in coverage.

D. Abatement Subcontractor shall indemnify, hold harmless, and defend the Owner and the Consultant and any of its affiliates, partially or wholly owner entities, and any of their agents, employees, or officers (hereinafter referred to as "Releases") from and against any and all losses, claims judgements, including legal fees and expenses, of any and every nature and description brought or recoverable against Abatement Subcontractor or Releases by reason of any act, intentional or otherwise, or employees, arising directly or indirectly from the nature of the work covered by this Agreement, including but not limited to, the removal, handling and disposal of hazardous material.

1.5 SPECIFIC ABATEMENT SUB-CONTRACTOR RESPONSIBILITIES

1.5.1 Notifications/Approvals

1. Provide in proper and timely fashion all necessary notifications to relevant Federal, State and local authorities and obtain and comply with the provisions of all permits or applications required by the work specified, as well as make all required submittals required under those auspices. The Abatement Subcontractor shall indemnify the Owner, Architect and Consultant from, and pay for all claims resulting from, failure to adhere to these provisions. The costs for all permits, applications, and the like, are to be borne by the Abatement Subcontractor. For each apartment, the Abatement Subcontractor shall notify in writing the following agencies, five (5) days prior to the date abatement will begin (in accordance with Local Law) and shall provide evidence of notifications to the Owner and General Trades Contractor at the preconstruction conference and on site at all times:

a. Certification or Licensing State Agency
b. Department of Public Health Childhood Lead Poisoning Prevention Program
c. Occupants of the Dwelling Unit to be abated and occupants of the Building to undergo abatement activities, in conjunction with Owner.

1.5.2 Fees, Permits and Licenses

A) The Abatement Subcontractor shall pay all licensing fees, royalties, and other costs necessary for the use of any copyrighted or patented product, design, invention, or processing the performance of the job specified in this Section. The Abatement Subcontractor shall be solely responsible for costs, damages or losses resulting from any infringement of these patent rights or copyrights. The Abatement Subcontractor shall hold the Owner, Architect and the Consultant harmless from any costs, damages, and losses resulting from any infringement of these patent rights or copyrights. If the Contract Specification requests the use of any product, design, invention, or process that requires a licensing fee or royalty fee for use in the performance of the job, the Abatement Subcontractor shall be responsible for the fee or royalty and shall disclose the existence of such rights.

B) Applications and Permits. The Abatement Subcontractor shall make all applicable and necessary notifications (in proper and timely fashion) to relevant federal, state, and local authorities and shall obtain and comply with the provisions of all permits or applications required by the work specified, as well as make all required submittals required under those auspices. The Abatement Subcontractor shall indemnify the Owner, Architect and Consultant from, and pay for all claims resulting from failure to adhere to these provisions. The costs for all permits, applications, and the like, are to be assumed by the Abatement Subcontractor.

C) The Abatement Subcontractor shall be responsible for securing all necessary permits for work under this Section, including hauling, removal, and disposal, fire, and materials usage, or any other permits required to perform the specified work.

1.5.3 Coordination/Cooperation. The Abatement Subcontractor shall meet with the Architect, Owner, and Consultant for a Pre-Construction meeting prior to commencing work on the project. The meeting shall be at the facility of Owner at a mutually convenient time and date to be determined by the Owner and Consultant. At the meeting, the Abatement Subcontractor shall be represented by authorized representatives and the field supervisors who shall run the project on a daily basis, and shall present evidence that all requirements for initiation of the work have been met. The minimum agenda for the meeting shall be:

A) Channels of communication;
B) Construction schedule, including sequence of critical work;
C) Designation of responsible personnel;
D) Procedures for safety, security, quality control, housekeeping, and related matters;
E) Use of premises, facilities and utilities;
F) Review of "Pre-Job Submittals;" and
G) Discussion of a detailed Project Specification Work Plan composed of at least the following:

· A sketch showing the detail, location and layout of the clean area, the dirty area (Decon System) and the work area.
· The sequencing of the work.
· The timing and projected completion of the work.
· Detailed description of the method to be employed in order to control airborne and waste water pollution.
· The type of equipment and amount of equipment available to the Abatement Subcontractor to be used on the project, including HEPA vacuums, etc.
· The procedures to contain, package and remove the waste from the work area and the procedures and locations of the disposal of hazardous and non-hazardous waste.
· An air sampling plan which includes:

  - Air sampling training and strategy, sampling locations, projected number of samples; and frequency, methodology, and duration of sampling.

· The type of respirators to be used, protective equipment to be used, and a respirator

program, if applicable.

- A safety precautions plan may include special precautions taken by the Abatement Sub or Subcontractors in performing their respective tasks, safety equipment to be worn by employees, frequency of safety meetings, and all other relevant functions to be performed by the abatement Contractors to ensure a safe workplace.
- Any other data that enhances this work plan. Innovative ideas and/or technology are encouraged.

1.5.4 Documentation/Submittals

A) Pre-Abatement/Job. The Abatement Subcontractor shall provide three (3) copies of the following Pre-Job Submittals at the Pre-Construction Conference for the acceptance of the Owner:

1) Copies of all notifications, permits, applications, licenses and like documents required by federal, state, or local regulations obtained or submitted in proper fashion.

2) Copies of medical records, including lead blood level monitoring data and a notarized statement by the examining medical doctor that such examinations took place, and when, for each employee to be used on the project.

3) Copies of Contractor's certificates, licenses, and copies of each supervisor's license and workers' certificates

4) Record of successful respirator fit testing performed by a qualified individual within the previous six months, for each employee to be used on this project with the employee's name and social security number with each record;

5) Proposed respiratory protection program for employees throughout all phases of the job, including make, model and NIOSH approval numbers of respirators to be used;

6) A detailed Project Specification Work Plan as described in Section 3.1.1.

7) Written description, for the Owner's review and acceptance, of all proposed procedures, methods, or equipment to be utilized that differ from the Contract Specifications, including manufacturers specifications on any equipment not specified for use by this Section; in all instances, the Subcontractor must comply with all applicable federal, state and local regulations.

8) Proposed electrical safeguards to be implemented by qualified Electrical Subcontractor, including but not limited to location of transformers, GFCI outlets, lighting, and power panels necessary to safely perform the job, including a description of electrical hazards safety plan for common practices in the work area.

9) Proposed worker orientation plan which at a minimum includes a description of lead hazards and abatement methodologies, a review of worker protection requirements, and the outline of safety procedures.

10) Chain-of-Command of responsibility at work site including supervisors, foreman, and competent person, their names, resumes and certificates of training.

11) List of all supervisors and workers intended to be assigned to the project.

12) Proposed Emergency Plan and route of egress from work areas in case of fire or injury, including the name and phone number of nearest medical assistance center. This shall be conspicuously posted at the work site.

13) The name and address of Abatement Subcontractor's blood lead testing lab, OSHA-CDC listing, and Certification in the state where work site is located.

14) The name and address of Abatement Subcontractor's personal air monitoring and waste disposal lead testing laboratory(ies) including certification(s) of accreditation for lead in the EPA National Lead Laboratory Accreditation Program, listing of relevant experience in air and debris lead analysis, and presentation of a documented Quality Assurance and Quality Control Program.

15) Material Safety Data Sheets (MSDS) on all materials and chemicals to be used on the project.

16) Name, address, and ID number of the hazardous waste hauler, waste transfer route, and proposed disposal site.

17) Name, address, and ID number of the proposed construction debris site.

18) Proposed heating system to be employed.

B) <u>During Job</u>. The Abatement Subcontractor is required to submit to the Owner and Consultant, a weekly status report including:

1) Number of buildings started
2) Number of buildings completed awaiting test results
3) Number of buildings failing clearance
4) Number of buildings passing clearance
5) Results from personal air samples
6) Results from TCLP testing
7) Results from other testing
8) Quantity of materials used during the abatement process. (Tyvek suits, poly, chemical, etc.)
9) Any other relevant data as requested by the Owner.
10) Medical, license, and Respirator Fit Test 24 hours in advance of any new employees starting on the project.

C) <u>Post-abatement</u>. The Abatement Subcontractor is required to submit to the Owner the following at a Post-Construction conference:

1) Copies of manifests and receipts acknowledging disposal of all hazardous and non-hazardous waste material from the project showing delivery date, quantity, and appropriate signature of landfill's authorized representative.

2) A notarized copy of the entry-exit logbook.
3) All personal monitoring results.
4) All TCLP test results.

1.6 PERSONAL PROTECTION

Respiratory Protection/Protective Clothing

A. Prior to commencing all work, all workers shall be instructed in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.

B. Respiratory protection shall meet the requirements of OSHA as presented in 29 CFR 1910.134 titled "Respiratory Protection" and 29 CFR 1926.62 titled "Lead in Construction." The protection factors shown in 29 CFR 1926.62 shall be used for this project.

C. Abatement Subcontractor shall provide appropriate respiratory protection equipment for each worker and ensure usage during potential lead exposure.

D. Abatement Subcontractor shall select respirators from among those jointly approved as being acceptable for protection by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11.

E. Abatement Subcontractor shall have adequate supply of HEPA filter elements or other necessary filter elements and spare parts on site for respirators in use.

Respiratory Protection Requirements

1. The Qualified Abatement Subcontractor shall provide respirators and all necessary maintenance materials at no cost to the employees. Employees shall wear the following respirators at all times while abatement work is underway or while present in the work area.

(a) For use while sanding, scraping or stripping with a heat gun, the minimum required respirator shall be the half-mask, air-purifying respirator equipped with HEPA filters or a powered, air-purifying respirator with high efficiency filters or the half mask supplied-air respirator operated in the positive-pressure mode, if required under local law.

(b) For use with caustics or in replacement, the minimum required respirator shall be the half-mask, air-purifying respirator equipped with high efficiency filters. Whenever a chemical preparation is used in conjunction with a mechanical or powered technique, the use of an additional combination cartridge, appropriate to the exposure, shall be used unless a supplied-air respirator is used.

(c) For use during removal or demolition of components with surfaces covered with lead-based paint, the minimum required respirator shall be the half-mask, air purifying respirator equipped with high efficiency filters.

1.7 SEQUENCING AND SCHEDULING

1.7.1 Work/Scheduling Requirements. Work shall be carried out in sequential phases. Inspection and approval of each phase by the Consultant shall be sought and gained before proceeding to the next phase and in accordance with the schedule agreed upon by Owner at the Pre-Construction meeting as amended. As a Contract requirement, any reasonable delay caused by this requirement will not constitute a basis for claim against the Owner or Consultant.

1.7.2 Job Sequences

A) The Abatement Subcontractor shall extend full cooperation to Owner in all matters involving the use of Owner's facilities. At no time shall the Abatement Subcontractor cause or allow to be caused conditions which may cause risk or hazard to the general public or conditions that might impair safe use of the facility. The use of the facility's electricity, water or like utilities by the Abatement Subcontractor shall be coordinated through the Owner.

B) The Abatement Subcontractor shall submit a time-line schedule, not date specific, to Owner and Consultant for integration into the overall project schedule. Coordinate the work of this section with that of all other trades. Phasing and scheduling of this project will be at the discretion of the Owner and Consultant and shall not proceed in any area without the express consent of the Owner and Consultant. The Abatement Subcontractor shall be available within 24 hours notice for additional work or rework if after acceptance of the work it is found that full abatement or clearance was not achieved from the initial work effort as determined by the Owner and Consultant.

It shall be understood by the Abatement Subcontractor that this project is being done on a building-by-building basis and delays between each building should be anticipated since the General Contractor must complete installation of the new electrical service conduit prior to starting a new building.

C) The proposed time line for the work in this Section, as noted above, shall show the time involved from start to finish of abatement operations, including preparation, removal, clean-up, and tear-down portions of the job.

D) A final written schedule shall be prepared for approval by the Owner and the Consultant.

1.7.3 Working Hours. Refer to Division 1 General Requirements Section 01020 1.02 for specific requirements.

A) The work in this Section shall be carried on under the usual construction conditions, in conjunction with all other work at the site. The Abatement Subcontractor shall cooperate with the Owner, Consultant, General Contractor, and sub-contractors and equipment suppliers working on the site, coordinate the work with them and proceed in a manner so as not to delay the progress of the project.

B) The Abatement Subcontractor shall coordinate the work with the progress of the work of other trades so that the work shall be completed as soon as conditions permit. Any overtime hours worked or additional costs incurred due to lack of or improper coordination with General Contractor or other trades of the General Contractor by the Abatement Subcontractor shall be assumed by the Abatement Subcontractor without any additional cost to the Owner.

C) Any costs associated with repeated cleaning due to a failure to achieve clearance shall be borne by the Abatement Subcontractor without any additional cost to the Owner.

PART 2 PRODUCTS

2.1 SUBSTITUTION OF MATERIALS AND/OR METHODS

A. Any substitution in materials or methods to those specified shall be approved by the Consultant and Owner **prior** to use. Any requests for substitution shall be provided in writing to the Consultant and the Owner. The request shall clearly state the rationale for the substitution.

B. Submit to the Consultant and the Owner product data and samples of all materials to be considered as an alternate.

C. Product data shall consist of manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, material safety data sheets (MSDS) and other standard descriptive data. Submittal data shall be clearly marked to identify pertinent materials, products or models and show performance characteristics and capacities. Samples shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product or material with integrally related parts and attachment devices.

D. No work shall begin which requires submittal for approval until the consultant has "approved" or "approved as noted" the submittal.

2.2 INTRODUCTION

2.2.1 Materials and Equipment

A. The work of this Section, without limiting the generality thereof, includes the furnishing of labor, materials, tools, equipment, services and incidentals necessary to complete all Lead Based Paint Abatement in accordance with the Plans and Specifications. These Plans and Specifications are intended to describe, and provide for a finished and complete piece of work; work which is described by any portion of these documents shall be complete in every detail and in accordance with established trade practice, notwithstanding whether or not every item or detail necessarily involved is particularly mentioned.

B. Approvals and Inspections. All temporary facilities, work procedures, equipment, materials, services, and agreements must strictly adhere to and meet this Section along with EPA, OSHA, NIOSH, HUD regulations recommendations, and guidelines, as well as any other federal state, and local regulations. Where there exists an overlap of these

regulations and guidelines, the most stringent one applies. All work performed by the Abatement Subcontractor is further subject to approval of the Owner, and/or Consultant.

2.2.2 Materials

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.

B. Damaged or deteriorating materials shall not be used and shall be removed from the premises.

C. Polyethylene sheet in a roll size to minimize the frequency of joints shall be delivered to job site with factory label indicating 6 mil.

D. Polyethylene disposable bags shall be six (6) mil with pre-printed label. Tie wraps for bags shall be plastic, five (5) inches long (minimum), pointed and looped to secure filled plastic bags.

E. Tape or adhesive spray will be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.

F. Impermeable containers are to be used to receive and retain any lead containing or contaminated materials until disposal at an acceptable disposal site. (The containers shall be labeled in accordance with EPA and DOT standards.

G. HEPA filtered exhaust systems shall be used during any dust generating abatement operations.

H. All caustics shall be properly labeled and containerized in leak-tight containers.

I. Machine Sanding Equipment - Sanders shall be of the dual action, rotary action, orbital or straight line system type, fitted with a high efficiency particulate air (HEPA) dust pick-up system.

Air compressors utilized to operate this equipment shall be designed to continuously provide 90 to 110 p.s.i. or as recommended by the manufacturer.

J. Heat Blower Gun Equipment - Electrically-operated, heat-blower gun shall be a flameless electrical paint softener type. Heat-blower shall have electronically controlled temperature settings to allow usage below a temperature of 1,100 degrees Fahrenheit. Heat-blower shall be DI type (non-grounded) 120 V, AC application. Heat-blower shall be equipped with various nozzles to cover all common applications (cone, fan, glass protector, spoon reflector, etc.).

K. Chemical Stripping Removers - Chemical removers shall contain no methylene chloride products. Chemical removers shall be compatible with, and not harmful to the substrate

that they are applied to. Chemical removers used on masonry surfaces shall contain anti-stain formulation that inhibits discoloration of stone, granite, brick and other masonry construction. Chemical removers used on interior surfaces shall not raise or discolor the surface being abated.

L. Chemical Stripping Agent Neutralizer - Chemical stripping agent neutralizers may be used on exterior surfaces only. Neutralizers shall be compatible with and not harmful to the substrate that they are applied to. Neutralizers shall be compatible with the stripping agent that has been applied to the surface substrate.

2.2.3 TOOLS AND EQUIPMENT

A. Provide suitable tools for all abatement operations.

B. The Abatement Subcontractor shall have available sufficient inventory or dated purchase orders for materials necessary for the job including protective clothing, respirators, filter cartridges, polyethylene sheeting of proper size and thickness, tape, and air filters.

C. The Abatement Subcontractor shall have available power cables or sources such as generators (where required).

D. Vacuum units, of suitable size and capacities for project, shall have HEPA filter(s) capable of trapping and retaining at least 99.97% of all monodispersed particles of 0.3 micrometers in diameter.

E. The Abatement Subcontractor will have reserve units so that the station system will operate continuously.

PART 3 - EXECUTION

3.0 LOCATION AND WORK STATEMENT

The site for abatement and locations of the effected buildings are described in the summary of work. The Abatement Subcontractor shall retain full ownership of all lead waste and construction waste generated during abatement procedures outlined in this specification. Specific work locations and component schedules are listed on Drawings as well as the locations listed below.

3.01 Exterior Component Abatement Schedules and Locations

A. Gutters and Downspouts. Gutters, downspouts, and associated hardware shall be removed from all residential buildings.

B. Drainage Boots. Drainage boots shall be removed from all residential buildings with the exception of the following buildings:

C. Exterior Trim Components. Exterior trim components shall be removed from all residential buildings at both sites. These components shall include the following:

1. Facia Board
2. Rake Board

3. Corner Board
4. Freeze Board
5. Skirt Board
6. Miscellaneous Trim

D. Siding. Exterior siding material shall be removed from the following buildings in Alternate Bid #1 only:

E. Canopies. The following list of canopy components shall be removed from all residential buildings at both sites. These components include:

1. Asphalt shingles
2. Building felt paper
3. Aluminum drip edge
4. Fascia boards
5. Rake boards
6. Soffits
7. Wood siding
8. Moldings
9. Flashing

F. Window Components. All window components shall be removed from all residential buildings at both sites (see Drawing) These components shall include the following:

1. Window sashes
2. Window trough casings
3. Window stops
4. Basement windows
5. Flashing
6. Caulks and Sealants
7. Storms and Screens

G. Door Components. All exterior door components shall be removed from all residential buildings at both sites. (See Drawing) These components include the following:

1. Doors
2. Door jambs and headers
3. Exterior casings
4. Interior casings
5. Thresholds
6. Flashing
7. Caulks and Sealants
8. Storms and Screens

H. Attic Vents. All exterior attic vents and associated trim shall be removed from all residential buildings. (See Drawing) These components include:

1. Louvre vents
2. Associated trim components
3. Screens
4. Flashing

K. Electrical Conduit. All electrical conduits associated with lead-based painted wood surfaces only are to be removed from all residential buildings.

L. Bulkheads. Existing flashing at all bulkheads is to be removed and disposed.

M. Stripping. On-site stripping of the following exterior components containing lead-based paint:

1. Bulkheads
2. Flashing and steel lintels at all brick masonry openings
3. Round crawlspace vents
4. Drainage system boots
5. Splattered paint on concrete and brick surfaces as designated by on-site testing
6. Exterior railings, guards, and balusters, as shown on pages 79 through 95.
7. Flashing at canopies on brick walls
8. Flashing at triangular louvre units

3.1 WORK AREA SET UP

3.1.1 General

A. Site Safety. The Abatement Subcontractor is responsible for all safety at the work site. This includes, but is not limited to electrical safety, mechanical (tool) safety, fire safety, and personnel protective safety. Safety requirements are, for the most part, common sense and sound business practice; however, the Abatement Subcontractor is advised that federal, state and local regulations exist which govern safety on the work site. Therefore, in addition to the following, the Abatement Subcontractor is responsible for adhering to the most stringent requirements in affect by any of the following entities or these Specifications.

1. A primary concern in this type of work is to ensure that adequate exits exist in the event of an emergency and conversely, that adequate entrances exist for emergency personnel. The nature of this work requires sealing entrances and the extensive use of six-mil polyethylene sheeting; however, the Abatement Subcontractor should never permanently seal (i.e., nail, bolt, hard cover) any potential escape exits and should take extra care to clearly identify potential exits and inform the workers.

B. WORK SITE SAFETY PLAN

Prior to the initiation of the abatement work, the following tasks must be completed by the Contractor:

The Abatement Subcontractor shall establish a work site safety plan which includes a set of emergency procedures and shall post them in a conspicuous place at the work site. The safety plan should include provisions for the following:

1) Evacuation of injured workers
2) Emergency and fire exit routes from all work areas, including local telephone numbers for fire and medical emergency personnel
3) Copies of applicable insurance certificates
4) Employee work logs

The Abatement Subcontractor is responsible for training all workers in safety procedures. At a minimum, one employee on site shall be trained and certified in basic first aid by the American Red Cross or equivalent. A general first aid kit may be maintained in the containment for treating minor medical problems.

C. Access to Work Areas

1. The Owner will provide specific access as required during the project to the Abatement Subcontractor and personnel assigned to the project. The Abatement Subcontractor will be responsible for the security of each building or portion thereof involved in the abatement project. It will also be the Abatement Subcontractor's responsibility to allow only authorized personnel as defined below in Section 3.5 into the work area, and to secure all assigned entrances and exits at the end of the work day so as to prevent unauthorized entry.

2. The Abatement Subcontractor shall maintain a bound log book in which any person entering or leaving the lead abatement work area must sign and enter the dates and times of entry and departure.

3. Use of waste containers on-site shall be controlled under the following requirements:

(a) Location of waste containers on-site shall be coordinated with the Owner and Consultant.
(b) The waste containers shall be solid enclosed containers, lined with two layers of six-mil polyethylene sheeting and locked and secured at all times.

(c) The Abatement Subcontractor shall comply with all federal, state and local regulations and ordinances regarding lead waste storage.

4. The Abatement Subcontractor, supervisor will not allow anyone access to the dwelling unless they have successfully passed an approved training program.

3.1.3 Exterior Abatement Preparation

A. Prior to the commencement of any abatement procedures, notification requirements must be met; required signs shall be posted and moveable objects shall be moved a minimum of four feet from the perimeter walls of the room.

B. Pre-abatement work shall be performed prior to any abatement or component removal commencing on each side of the building.

C. Decontamination Unit. At a minimum, the Abatement Subcontractor shall construct a two-stage decontamination unit. This unit shall be directly adjacent to the abatement area for the decontamination of workers contaminated with lead. The decontamination unit shall consist of an equipment room, dirty room, and wash area in series. The Contractor shall ensure that employees use the worker decontamination chamber prior to leaving the work area.

1. The decontamination unit shall be constructed with six-mil polyethylene sheeting on floors, walls and ceiling. Doors through this unit shall be constructed as described in paragraph 7, above.

D. Clean Area. The Abatement Subcontractor shall select a clean area outside the abatement area for the workers to change into protective equipment. This area shall contain warm water hand washing facilities (potable water), clean cloths, storage for a HEPA vacuum, and respirator storage space. Table, chairs and a rest facility shall also be available at this location. Contaminated equipment or personnel shall not be permitted in this area.

E. Abatement Area.

1. The Abatement Subcontractor shall pre-clean all surfaces with a HEPA vacuum and protect occupants' belongings by covering with one layer of six mil polyethylene and have joints taped. All debris gathered during this clean-up shall be disposed of properly. In addition, any existing loose paint or paint bearing materials found in the buildings are to be assumed hazardous and packaged and disposed of properly. The amount of the material should be estimated during the pre-bid walkthrough.

2. For exterior work, the Abatement Subcontractor shall prepare the area as follows:

a) Doors and Windows: Doors and windows on the side of the building upon which a dust-generating method is being used, and on the same floor and all floors below, must be closed and covered with six-mil thick polyethylene sheeting.

b) Plants and Ground: The ground and any plants or shrubs in the area in which exterior abatement is occurring shall be covered with a waterproof canvas tarp and weighted at all edges so as to prevent blowing. Such covering shall cover from the side of the structure to a point at least eight feet away from the structure. The covering shall be taped or otherwise attached to the structure.

(1) The waterproof canvas tarp shall always be placed in a manner that traps all debris and water. This is best accomplished by elevating the edges.

(2) The waterproof canvas tarp shall be properly disposed of and not re-used.

3. Special Areas. Any abatement project being performed on any structure other than a building shall be arranged, equipped and operated in a manner which will eliminate the possibility of lead contaminants or lead contaminated materials escaping from the work area.

a) The Abatement Subcontractor shall maintain polyethylene barriers, and a clean area as long as needed for the safe and proper completion of the work. Any openings or tears in the work area barriers shall be corrected by the Abatement Subcontractor at the beginning of each work day and as necessary during the workday with such openings or tears reported immediately to the Owner. Work will not be allowed to commence until all barriers are in place and acceptable to the Consultant.

4. Barriers shall not be removed until the work areas are thoroughly cleaned, and the area approved by the Consultant. All debris must be properly bagged and removed from work areas, and the lead surface wipe samples must have passed final clearance tests, in accordance with provisions detailed in the Specification prior to barrier removal.

5. At the Owner's and Consultant's approval, the Abatement Subcontractor may utilize a portable mini-isolation chamber to create an isolated work area around single components to be removed. This chamber shall still be equipped with an adjacent clean room, and become an isolated work area sealed at all seams to where it is attached to adjacent surfaces. It shall also satisfy all requirements for a work area and satisfy all clearance criteria, as identified in this Section and Local Law.

G. Signs. Prior to the preparation of a dwelling for abatement, the Abatement Subcontractor shall place warning signs immediately outside all entrances and exits to the dwelling, warning that abatement work is being conducted in the vicinity. The signs shall be at least 20" x 14" and read:

WARNING:
LEAD PAINT REMOVAL HAZARD
UNAUTHORIZED ENTRY PROHIBITED
NO SMOKING, EATING OR DRINKING ALLOWED IN THE WORK AREA

Signs shall be in bold lettering with lettering not smaller than two inches tall.

H. Construct and maintain suitable polyethylene barriers within the building to isolate the exterior work area from the interior of the building.

I. The polyethylene barriers termed "critical barriers" for the removal of windows shall consist of the following:

1. Pre-Clean all interior window surfaces with a HEPA-equipped vacuum.

2. Seal duct tape lip to inner most sill, casing and header surfaces of the window.

3. Seal two layers of six mil polyethylene sheeting from the duct tape lip on the inside sill of the dwelling unit window and extend up to the inside surface of the top interior casing. The first layer of sheeting applied shall be sealed to the inside faces of the window casing. The polyethylene sheeting shall be sealed to a piece of three-inch wide duct tape forming a lip attached to the interior window perimeter of the window casing. Refer to Diagram.

4. There shall be no cavity in the polyethylene sheeting created that would allow lead dust to accumulate, which cannot be removed with HEPA vacuuming. This shall allow for

removal of this polyethylene sheeting from the exterior of the building, without the generation of lead dust, once the window is removed and cleanup is complete.

5. The second layer of polyethylene sheeting shall be applied over the first layer and sealed directly to the inner face of the cut tape lip and window sill and casing.

6. This sealing of windows shall be done from the interior prior to the beginning of any exterior work.

J. The critical barriers for the removal of front and back doors and front and back door jambs, casing, and associated trim, shall consist of the following:

1. After precleaning activities of HEPA vacuuming floor and surfaces to be abated, seal with duct tape one layer of polyethylene sheeting over a 4' x 4' floor area extending in from the entrance doorway. This floor sheeting shall extend a minimum of six inches up the adjacent wall.

2. Remove the entrance door as described in this section.

3. Construct a mini-containment chamber with a double layer of six-mil polyethylene sheeting to isolate the inside door frame from the interior of the unit.

4. Seal mini-containment chamber to the interior wall a minimum of six inches from the interior door casing. Seal walls of the chamber to the floor poly. Cover ceiling with one layer of six-mil polyethylene. A prefabricated containment system may be used if approved by the Consultant.

5. Allow sufficient clearance around the door frame and casing to permit workers adequate access to remove the components without breaching the containment system.

6. Containment chamber shall remain in place during door, door casing, and jamb replacement.

K. The exterior of the building and the ground surrounding the building shall be covered with plastic sheeting or tarpaulins from the edge of the building to a point at least eight feet away and secured to the ground.

L. The poly barriers shall not be removed until after all debris, dust, and chips are vacuumed up from the exterior.

M. Maintain polyethylene barriers, as long as needed for the safe and proper completion of the work. Any breeches in the work area barriers shall be corrected immediately and as necessary during the work day with such breeches reported immediately to the Owner. Work will not be allowed to commence until all barriers are in place and acceptable to the Consultant.

N. Window barriers shall not be removed until the window opening and polyethylene sheeting thoroughly cleaned as specified in this section, all debris has been properly

bagged and removed from work areas, and the lead surface wipe samples have been taken in accordance with provisions detailed herein.

3.2 OCCUPANT PROTECTION

During the course of the abatement project, the protection of the building occupants and their belongings shall be the responsibility of both the Abatement Subcontractor and the occupants. Relocations of occupants and the use of engineering controls shall be employed throughout the entire project.

3.2.1 Owner's Responsibilities

The Owner shall be responsible for all aspects addressing the relocation of tenants during daily construction activities of the abatement project. This shall include, but not be limited to, the following:

A. Provision of supplementary living quarters for tenant displaced during daily construction activities.

3.2.2 Tenant's Responsibility

The tenants shall be responsible for providing an unobstructed work place for the Abatement Subcontractor prior to vacating the unit during daily construction activities. The tenants' responsibilities include, but are not limited to, the following:

A. Removal of all paintings, pictures, plaques, draperies, shelves, and otherwise applied items from outside wall surfaces within the apartment.

B. Removal of all furniture from around the perimeter of the outside walls to a location in the center of the room no closer than four (4) feet from the work area walls. If the room is too small to accomplish this, the furniture must be removed from the room.

C. If the tenants are not capable of moving large items, the Owner shall be notified forty-eight (48) hours in advance, and shall supply a work crew to do so.

3.2.3 Abatement Subcontractor's Responsibility

The Abatement Subcontractor shall be responsible for establishing and maintaining all engineering controls referenced herein and as required to prevent dispersal of lead contamination from the work area. While this is the prime responsibility of the Abatement Subcontractor, additional responsibility will include, but not be limited to, the following:

A. Provide notifications and posting as required by these specifications.

B. Protect tenants' personal possessions as specified in these specifications including, but not limited to, furniture and boxed items located in the center of work area rooms.

C. The Abatement Subcontractor shall be responsible for and bear all costs resulting from damage caused to the tenants' possessions during the abatement work.

3.3 PROTECTIVE PROCEDURES

3.3.1 Personal Air monitoring. Both personal air and area (ambient) air sampling will occur periodically throughout the project. The Abatement Subcontractor is advised of the following sampling:

A. Consultant will perform clean area air monitoring sampling and analysis for all phases of the work in this Section. This sampling will include personal air monitoring of Abatement Subcontractor employees and ambient air sampling within the work area.

B. Air samples may also be collected by the Consultant outside critical barriers of the work area in the clean room, and in areas adjacent to the clean room.

C. The Consultant will also collect wipe samples both within the abatement area and outside.

D. Any adjustment, tampering, and/or deliberate interference with Consultant air monitoring equipment by the Abatement Subcontractor's personnel will not be tolerated. Furthermore, the Abatement Subcontractor may be held liable for prosecution under applicable laws and regulations for attempting to falsify test results.

3.3.2 Worker Protection Requirements

A. Biological Monitoring. All workers must have baseline and post-abatement blood lead level measurements determined by the whole blood lead method, utilizing the Vena-Puncture technique with results provided to the Owner and Consultant. This screening shall be performed every two months for the first six (6) months, and every six months thereafter if blood lead levels do not increase by more than 10 µg/dl. In addition, the Abatement Subcontractor shall have a medical examination performed on each employee. This medical examination must be performed before workers begin lead contaminated work area and at the termination of an employee's employment or yearly, whichever comes first. A worker shall be removed from the job whenever three blood sampling tests average more than 25 µg/dl or if a single test exceeds 30 µg/dl. A formal investigation shall occur whenever a worker's blood lead level rises more than 10 µg/dl over the baseline level. The Abatement Subcontractor shall be responsible for medical surveillance and record keeping, as defined in the OSHA Lead in Construction Standard (29 CFR 1926.62) and Local Law.

B. Training Requirements. All workers and supervisors shall have successfully completed a course provided by a licensed training provider meeting all requirements of EPA and Local Law. Supervisors shall be licensed by the responsible Local State Agency responsible. The Abatement Subcontractor will adhere to the requirements of OSHA regulations CFR 1910.1200 and 1926.62.

C. Supervision. The Abatement Subcontractor shall provide one site supervisor whose responsibilities include coordination, safety, security and execution of all phases of the lead removal project. The supervisor shall not be used as a lead removal worker, and shall be assigned full time to the project. The supervisor shall be fully qualified in all

aspects of lead abatement practices and procedures, and have a three-day training course provided by a certified training provider and approved by the responsible Local State Agency within the previous year prior to commencement of lead-related work.

D. Respirators and Personal Protective Equipment (PPE)

1) Personal protection in the form of disposable coveralls and NIOSH and MSHA approved respirators, is required for all workers, supervisors, and authorized visitors entering the work area during the abatement and cleaning operations. A half-face negative pressure respirator is required until air monitoring data proves otherwise. Authorized visitors (i.e., federal, state, and local inspectors) must provide a current health and medical report certifying them as approved to wear half-face respirators, and must wear PAPRs until air monitoring data permits the use of half face respirators.

2) Each worker shall be supplied with a minimum of two (2) complete disposable suits every day. Removal workers shall not be limited to two (2) suits, and the Abatement Subcontractor will be required to supply additional suits as is necessary. In addition to disposable suits for the workers, the Abatement Subcontractor shall also supply suits for the Consultant and other personnel who are authorized to inspect the worksite. Contractor must consider this cost in the bid. Disposable suits, such as TYVEK suits, and other personal protective equipment (PPE) must be donned prior to entering work area. A clean area will be provided for workers to put on suits and other personal protective equipment and to store their street clothes.

   Suits will be worn inside the work area after the area passes pre-abatement inspection and shall remain in use until the area passes final clearance inspection. Light weight nylon clothes may be worn under the suit, but these clothes must be changed before leaving the work area and should be laundered separately.

3) Work clothes shall consist of moisture repellent, disposable full-body suits, head covers, gloves with cuffs extending outside the sleeves of the protective suit, boot or shoe covers, a face shield and eye protection. Hard hats shall be worn. In addition, when caustic paste is used as an abatement agent, full-body suits and gloves impervious to caustics, glove extenders, face shields and boot or shoe covers are required.

4) Eye protection to personnel engaged in lead operations shall be furnished when the use of a full face respirator is not required.

5) Goggles with side shields will be worn when working with a material that may splash or fragment, or if protective eye wear is specified on the Material Safety Data Sheet (MSDS) for that product.

6) Additional respiratory protection by supplemental filters, such as organic vapor cartridges, may be needed when handling some coating products. Consult the Material Safety Data Sheets (MSDS) and obtain the proper filters as necessary.

7) The Abatement Subcontractor shall provide portable eyewash stations inside all work areas where caustic paste is to be used.

The stations should be capable of providing a flow of water for at least five minutes. The Abatement Subcontractor shall provide another station capable of providing a flow of water for at least fifteen minutes in the clean area. Squeeze bottles are not sufficient eyewash stations.

8) The Abatement Subcontractor shall supply workers and supervisory personnel with NIOSH and MSHA approved respirators and HEPA filters. Respiratory protection shall be implemented for all work performed by the Abatement Subcontractor under this Section. The respirators shall be sanitized and maintained according to the manufacturer's specifications. Disposable respirators shall not be considered acceptable under any circumstances. The Abatement Subcontractor will maintain on-site a sufficient supply of HEPA filters to allow workers and supervisory personnel to change contaminated filters per manufacturer's recommendations or when breathing resistance is encountered. The Abatement Subcontractor is solely responsible for means and methods used and for compliance with applicable regulations:

(a) Half-mask, negative pressure, air purifying respirators equipped with high efficiency filters for airborne lead dust levels not in excess of 0.5 mg/m3 (10 times the Permissible Exposure Limit) shall be used during component removal and enclosure abatement methods, with the exception of surface preparation for enclosures.

(b) Full-face Powered Air Purifying Respirators (PAPRs) with high efficiency filters for airborne dust levels not in excess of 2.5 mg/m3 (50 time the Permissible Exposure Limit) will be required during all abatement demolition methods and encapsulation surface preparation methods and as required by OSHA 1926.62.

(c) Pressure demand, full face, supplied air respirators are required when airborne lead dust concentrations are expected to meet or exceed 50 mg/m3 (1000 times the Permissible Exposure Limit). Respirators will not be removed until the worker enters the washing area of the decontamination chamber.

9) Respirators shall be individually assigned to removal workers for their exclusive use. All respiratory protection shall be provided to workers in accordance with the approved respiratory protection program, which includes all items in OSHA 29 CFR 1910.134 (B),(D),(E), & (F), and the OSHA lead standard 29 CFR 1926.62. A copy of this program shall be kept at the worksite, and shall be posted in the clean area.

10) Workers must perform negative and positive pressure fit checks each time a respirator is put on, whenever the respirator design so permits.

11) Powered air purifying respirators (PAPR) shall be tested for adequate flow as specified by the manufacturer.

12) Workers shall be given a qualitative fit test in accordance with procedures detailed in OSHA 29 CFR 1910.1025, Appendix D, Qualitative Fit Test Protocols, for all respirators to be used on this abatement project. An appropriately administered quantitative fit test may be substituted for the qualitative fit test.

13) If a question exists as to the proper selection of respirators, the Contractor may consult the OSHA Lead in Construction Standard (29 CFR 1926.62).

14) Upon leaving the active work area, cartridges must be removed, and respirators cleaned in a disinfectant solution and clean water rinsed.

15) Clean respirators should be stored in plastic bags when not in use.

16) The Abatement Subcontractor shall inspect respirators daily for broken, missing, or damaged parts.

17) The Abatement Subcontractor shall provide personal sampling to check personal exposure levels. Samples shall be taken for the duration of the work shift or for eight hours, whichever is less. Personal samples need not be taken every day but must be taken in accordance with 29 CFR 1926.62. Sampling will determine eight-hour Time-Weighted Average exposures (TWA). Results shall be provided to the Owner and Consultants within 48 hours of the sampling.

18) Abatement Subcontractor shall comply with all OSHA, state, or other applicable requirements of worker medical examinations for approval to wear respiratory protection, and shall submit document of such approval to the Owner.

E. Exposure Conditions. If air monitoring data, gathered by the Abatement Subcontractor or Consultant shows that worker exposure to airborne lead exceeds 50 µg/m3, the following conditions apply:

1) Clothing. Street clothes cannot be worn into containment. Workers must wear nylon shorts, TYVEK shorts, or nothing under disposable suit.

2) Showers. Showers must be provided. Shower water must pass through at least a 5.0 micron filter before returning to the public waste system.

(a) All workers must shower upon leaving the work area.

(b) A five-stage decontamination unit must be constructed of six-mil polyethylene sheeting and consisting of a dirty room, airlock, shower, airlock, and clean room.

3.3.3 Personal Air Sampling

A. General. The Abatement Subcontractor is required to perform the personal air sampling activities during all lead paint abatement work. The results of such sampling shall be posted, provided to individual workers, and submitted to Owner and Consultant as described herein.

B. Sampling. Samples shall be taken for the duration of the work shift or for eight hours, whichever is less. Personal samples need not be taken every day after the first day if working conditions remain unchanged, but must be taken every time there is a change in the removal operation, either in terms of the location or the type of work. Sampling will be used to determine eight-hour Time-Weighted Averages (TWA). The Abatement

Subcontractor is responsible for personal sampling as outlined in OSHA Standard 29 CFR 1926.62. This sampling will determine the degree of respirator protection required, subject to the regulations.

C. Sampling Results. Air sampling results shall be transmitted to the Owner and individual workers in written form no more than forty-eight (48) hours after the completion of a sampling cycle. The reporting document shall list each sample's result, sampling time and date, personnel monitored and their social security numbers, flow rate, sample duration, sample yield, cassette size, and analysts' name and company, and shall include an interpretation of the results. Air sample analysis results will be reported in micrograms of lead per cubic meter of air (µg/m3).

D. Testing Laboratory. The Abatement Subcontractor's testing lab shall be certified for lead air sample by the American Industrial Hygiene Association. Abatement Subcontractor shall submit for the Owner's and Consultant's review and acceptance the name and address of the laboratory, certification(s) of accreditation for heavy metal analysis, and a listing of relevant experience in air lead analysis, and presentation of a documented Quality Assurance and Quality Control program.

E. Air Monitoring Frequency. The air monitoring frequency for Abatement Subcontractor operations will be established in accordance with the requirements set forth in 29 CFR 1926.62.

3.4 WORKER HYGIENE PRACTICES. In order to avoid possible exposure to dangerous levels of lead and to prevent possible contamination of areas outside the demarcated work area, work shall follow the general guidelines listed below:

3.4.1. Work Area Entry. At no time shall a worker or other authorized personnel entering the work area go further than the Clean Area without proper respiratory protection and protective clothing.

3.4.2. Work Area Departure. The worker shall remove all gross contamination, debris and dust from the disposable suit by completely HEPA vacuuming them before leaving work area.

3.4.3 Personal Protective Equipment. All persons leaving the work area must remove their personal protective equipment (except respirators) before leaving the containment. Suits shall be removed "inside out" to minimize the dispersal of lead dust.

3.4.4 Wash Facilities. All workers must wash upon leaving the work area. Wash facilities will be provided by the abatement Subcontractor. This wash facility will consist of, at least, warm running potable water, soap, and towels. All waste water must be contained and disposed of in accordance with this Specification.

3.4.5 Equipment. All equipment used by the workers inside the work area shall be either left in the work area or thoroughly decontaminated before being removed from the area. Extra work clothing (in addition to the disposable suits supplied by the Abatement Subcontractor) shall be left in the clean area until the completion of work in that area.

The clean area shall be cleaned of all visible debris and disposable materials daily.

3.4.6. Prohibited Activities. Under no circumstances shall workers or supervisory personnel eat, drink, smoke, chew gum, or chew tobacco or remove their respirators in the work area. To do so shall be grounds for the Owner and/or Consultant to STOP all removal operations. Only in the case of life threatening emergency shall workers or supervisory personnel be allowed to remove their protective respirators while in the work area. In this situation, respirators are to be removed for as short a duration as possible.

3.4.7 Footwear. As with additional clothing, all work footwear shall be left inside the decontamination area until the completion of the job and then shall be HEPA vacuumed and wiped or discarded as contaminated waste.

3.4.8 Shock Hazards. The Abatement Subcontractor is responsible for using safe procedures to avoid electrical hazards. Power will be shut off and checked before work begins when a hazard exists.

All extension cords and power tools used within the work area shall be attached to Ground Fault Circuit Interrupters (GFCI).

3.5 CONTROL OVER ABATEMENT WORK

All work procedures shall be continuously controlled and monitored by the Contractor to assure that the building will not be further contaminated. The following controls shall be instituted on each working day:

3.5.1 Start Up

Prior to work on any given day, the Contractor's designated project supervisor will discuss the day's work schedule with his work force to evaluate job tasks with respect to safety procedures and requirements specified to prevent contamination of the other parts of the building or the employees. This includes a visual survey of the work area and the decontamination enclosure systems.

3.5.2 Access

The Contractor shall maintain control of and be responsible for access to all work areas to ensure the following requirements:

A. Non-authorized personnel are prohibited from entering the area at all times of day and night;

B. All authorized personnel entering the work area shall be familiar with the worker protection procedures contained in this specification and shall be equipped with properly fitted respirators and protective clothing;

C. All personnel who are exiting from the decontamination enclosure system shall be properly decontaminated;

D. Lead waste which is taken out of the work area must be properly handled in accordance with these specifications. The surface of any waste containers, removed from the work area, shall be wiped down with a minimum of a 5% solution of tri-sodium phosphate or other equivalent cleaning agent prior to removing it from the work area.

E. Building components with lead painted surfaces shall be removed from the work area and placed directly into a labelled and secured disposal container or a designated storage area.

3.6 EXTERIOR ABATEMENT SEQUENCING

A. The established sequencing for hazardous material abatement for this project dictates that the Abatement Subcontractor performs the pre-removal work area preparation procedures for all buildings included in this project. This includes all buildings with asbestos-containing transit siding.

B. Exterior variations have also been established in regards to siding type, presence of exterior wood trim and drainage components painted with lead-based paint, and material composition of the existing building felt paper and associated adhesive. Each building type has a corresponding abatement sequence. The following list represents the three building variations identified and their corresponding building types:

1. Variation 1: Asbestos-containing transit siding with asbestos-containing building paper and lead-based paint covered trim and drainage components.

2. Variation 2: Lead-based paint covered wood siding with asbestos-containing building paper and lead-based paint covered exterior trim and drainage components.

3. Variation 3: Lead-based paint covered wood siding with nonasbestos-containing building paper and lead-based paint covered exterior trim and drainage components.

3.6.1 Removal Sequencing of Building Exterior Variations

Due to the layered composition of different hazardous materials (e.g., lead-based paint covered exterior trim applied onto transit siding), slightly different sequences of removal operation will be required. The following sequences are broken down by exterior variations.

3.6.1.1 Variation 1 Sequence

A. The Abatement Subcontractor will be first on the job.

B. The Abatement Subcontractor will provide work area set-up for one entire building in accordance with specifications.

C. The Abatement Subcontractor will perform all exterior lead trim component and drainage system components effecting the removal of the transit siding. These components will include, but not be limited to, the following:

1. Rake Boards
2. Facia Boards
3. Corner Boards Wall Vents
6. Downspouts Conduit
7. Gutters
8. Associated Hardware
11. Roof & End
12. Soffit
13. Electrical

4. Skirt Boards
5. Moldings
9. Drainage Boots
10. Canopies

D. Work shall be performed sequentially to allow the Asbestos Removal Contractor to start asbestos work as soon as possible.

E. The Abatement Subcontractor will perform preliminary clean-up and wipe barriers prior to the Asbestos Contractor working on that side of the building.

F. The Abatement Subcontractor will continue to work around the building as defined herein.

G. The Asbestos Removal Contractor will commence work on the initial side abated when the Lead Abatement Contractor has completed the initial clean-up on that side and component removal on the subsequent adjacent side.

H. The Asbestos Removal Contractor will remove and dispose asbestos shingle siding, felt paper, and associated tar adhesive.

I. The Asbestos Removal Contractor will then perform preliminary clean-up and wipe all barriers clean. The asbestos inspector will perform a visual inspection to ensure all asbestos containing materials have been removed before barriers are removed.

J. The Asbestos Removal Contractor will remove all barriers and dispose as construction debris.

K. The Abatement Subcontractor and Asbestos Abatement Subcontractor will continue work in a fashion that will not cause leaded waste products to be combined with asbestos waste products.

3.6.1.2 Variation 2 Sequence

A. The Abatement Subcontractor will be first on the job.

B. The Abatement Subcontractor will provide work area set-up for one entire building in accordance with Specifications.

C. The Abatement Subcontractor will perform all exterior lead component removal, as defined in these Specifications, including siding, but excluding felt paper and adhesive, and excluding doors, windows, and associated components (i.e., trim, sills) one side of the building at a time.

D. Work shall be performed sequentially to allow the Asbestos Removal Contractor to start his work as soon as possible.

E. The Abatement Subcontractor will perform preliminary clean-up and wipe barriers clean

prior to Asbestos Contractor working on that side of the building.

F. The Abatement Subcontractor will continue to work around the building as defined herein.

G. The Asbestos Removal Contractor will commence work on the initial side when the Lead Abatement Contractor has completed the initial clean-up on that side and component removal on the subsequent adjacent side.

H. The Asbestos Removal Contractor will removal all felt paper and associated tar adhesive.

I. The Asbestos Removal Contractor will then perform preliminary clean-up and wipe all barriers clean.

J. The Asbestos Removal Contractor will removal all barriers and dispose as construction debris.

K. The Abatement Subcontractor and Asbestos Abatement Subcontractor will continue work in a fashion that will not cause leaded waste products to be combined with asbestos waste products.

3.7 ABATEMENT PROCEDURES

3.7.1 General

A. Overview. The information contained in this section indicates specific abatement procedures for designated components. The actual components to be abated are found on Drawings and schedules located in Section xxx of the Contract Documents.

B. Workmanship. All lead-based paint abatement activities shall be conducted in a professional workman-like manner.

3.7.2 Exterior Component Removal

A. General. Abatement procedures detail both specific components and the generalities of component removal. Generalities of abatement are detailed below. All resulting bundles of "containers" of removed components and/or debris shall be carefully handled to reduce the potential of ripping, bursting, or otherwise diminishing the integrity of the bundle of "container."

1. Provide work area preparation in accordance with Section 3.1.

2. Care must be taken so that leaded materials are neither burned, nor dusted, nor result in further exposure to workers, residents, children, or observers.

3. Care shall be taken to avoid damage to adjacent areas during the removal of components to be replaced. The Abatement Subcontractor shall run a utility knife around the edge (score) of the abatement substrate and the adjacent (non-abated) substrate to cut any bonding between the substrates and thereby eliminate damage.

4. If components to be removed contain gross areas of loose of peeling paint, these areas

shall be wet scrapped or HEPA vacuumed prior to removal. The paint chips shall be contained either in the HEPA vacuum or in a separate six (6) mil polyethylene bag. Temporary encapsulants expressly for this purpose are also acceptable.

5. Components that are removed for replacement shall be temporarily wrapped for transport to the dumpsters. Care shall be taken when transporting leaded components from the work area to the dumpster. All leaded components shall be sealed in air tight containers from transport to the dumpster. Once the material has been transferred, it shall be removed from the container and placed in the lined dumpster. Specific components and abatement procedures are:

a. Drainage Components

(1.) Gutter and downspouts. A pry device may be used to carefully remove all brackets and hardware providing support to the gutters and downspouts. Once the brackets have been removed, carefully remove and lower gutters and downspouts to the ground. To not drop or handle in a way that will cause additional damage to the painted surfaces. Once the gutters and downspouts are removed, cut into manageable lengths no greater than three (3) linear feet in length. Remove all nails prior to disposal.

(2.) Drainage Boots.

A pry device may be used to carefully remove all brackets and hardware providing support to the drainage boots. Carefully remove the drainage boots for disposal. Where required, excavate to a depth of six (6) inches below grade and snap cast iron boot to be capped by General Contractor. Boots may be stripped of lead-based paint on site and then disposed of as construction debris. All on-site stripping shall be performed in a secure area approved by the Consultant in accordance with Section 3.1.

b. Exterior Trim. A pry device shall be utilized to carefully remove the exterior trim. Once the exterior trim has been removed, the resulting material shall be cut into lengths that are easily managed for the purposes of containerization. Carefully lower trim boards to the ground; do not drop.

c. Canopies. A pry device shall be utilized to carefully remove the individual components of the canopies. Remove each component of the canopy and carefully lower to the ground. Care shall be taken to preserve the integrity of the structural elements of the canopies. Coordinate removal of existing lighting with the Electrical Subcontractor. Containerization shall be accomplished by removing or flattening all nails to prevent punctures or tearing.

d. Attic Vents. A pry device shall be utilized to carefully remove the attic vents. Remove each attic vent and associated trim components and carefully lower to the ground. Care shall be taken by the Abatement Subcontractor to avoid damaging existing roofing felts and shingles. If damaged shingles are observed by the Abatement Subcontractor before work commences, the Consultant must be informed. Failure to inform the Consultant will result in the Abatement Subcontractor assuming responsibility for the damage.

e. Porch Lattice. Carefully detach porch lattice from facade of building and porch landing

for disposal.

f. Exterior Wood Shingles, Clapboards, and Soffit. A pry device shall be utilized to carefully remove the exterior wood shingles, clapboards, and soffit. When siding and soffits, avoid dropping a distance greater than ten (10) feet. Continuously control dust utilizing an airless spray or apply a light application of water. Avoid damaging felt paper at all buildings. Do not allow waste to accumulate. Remove or bend back all nails from existing sheeting. Cut clapboard to sections no greater than three (3) feet lengths. Containerization shall be accomplished by removing or flattening nails to prevent punctures or tears in container lining.

g. Electrical Conduit. On all lead painted surfaces, carefully remove electrical conduit by using a pry device (crow bar "pig's foot", etc.) in such a manner as to protect integrity of conduit and adjacent surfaces from damage. Coordinate and perform work under supervision of the Electrical Subcontractor.

1. The Abatement Subcontractor shall perform all procedures as defined in Section 02090 3.7.3 A.

2. All windows sashes, sills, jambs, and trim on basement windows shall be removed down to a base substrate surface (rough opening).

i. Removal of Window Components

1. Execution of component removal shall follow applicable methods specified in this section. Window component removal shall be limited to the individual components listed in Section 3.0 of this specification.

2. Preparation procedures identified in 3.1 and 3.2, shall be strictly adhered to. Using a HEPA vacuum equipped with a metal attachment, remove and vacuum all loose chips and flakes of paint from window trough components and remove existing exterior storm windows and screens and dispose of as construction debris.

3. Any damage to adjacent surfaces due to component removal shall be repaired and restored with similar or better materials to the approval of the Owner.

4. The sequence of work for component removal shall follow this prescribed order:

   a. Unscrew exterior stops and remove
   b. Remove top sash
   c. Remove parting beads with pry or pliers
   d. Remove bottom sash
   e. Using a pry, remove right and left side window trough casings
   f. Pry off head stop
   g. Remove existing mullions
   h. Remove exterior header
   i. Remove all loose dirt and debris, HEPA vacuuming all surrounding surfaces and window well
   j. Follow procedure of 5. below

5. After initial clean-up procedures are completed the following shall occur:

a. Inspector shall be notified of completion of window removal and clean-up
b. Inspector will perform a visual inspection
c. Once acceptable, encapsulate window components with white latex spray paint
d. Keep critical barriers intact
e. If no visible debris is found, window replacement shall proceed as specified in Section xx of Architectural Specifications.

J. Removal of exterior door jambs and casings and exterior doors.

1. Removal of doors, door jambs and casings shall be limited to the following:

a. Front and back entrances

2. Any damage to adjacent surfaces due to component removal, shall be repaired and restored with similar or better materials to the approval of the Owner.

3. All door jambs and casings scheduled for abatement will be removed according to this prescribed sequence.

a. Preparation procedures shall be performed as described in 3.1 and 3.2.

b. Carefully score paint and caulk lines at walls adjoining casings with razor knife. Removal of jambs and casings shall not damage existing plaster or gypsum board and paint.

c. Carefully pry jambs and casings from wooden anchors and remove, using a wood block at the fulcrum point to protect the plaster.

d. Remove any protruding paint ridges. Scrape and HEPA vacuum all loose paint and debris.

e. Fill damaged spaces with plaster to make walls smooth.

4. After initial cleanup procedures are completed, the following shall occur:

a. Inspector shall be notified of completion of removal and proper cleanup.

b. Inspector will inspect for any visible dust or debris.

c. After approval is given by Inspector, door system installation shall occur without the removal of the mini-containment chamber.

d. Once door system is installed according to the specification, chamber may be removed after HEPA-vacuuming of the chamber surfaces.

3.7.3 CAUSTIC PAINT REMOVAL - PROCEDURES

A. General. Caustic paste application and use shall be in accordance with manufacturer's instruction for each product. Prior to beginning the application, all accumulated dust, dirt, and visible oil and grease shall be removed with a five percent TSP and water solution or other equally effective cleaning agent. When a caustic stripping agent is used as the abatement agent, the Abatement Subcontractor shall provide and ensure the use of

the following items:

- Full-body coveralls with hood impervious to caustic substances;
- Gloves impervious to caustic substances;
- Glove extenders;
- Face shield;
- Appropriate boot or shoe covers;
- An eyewash station;
- A suitable and unrestricted wash area in the event of inadvertent exposure.

1. Paint Removal - A caustic stripping agent may require multiple applications, depending on a variety of circumstances. When this type of material is used, care should be taken to avoid drying of the agent. It may become necessary to lightly mist over area with water to keep it moist. Surfaces that come in contact with the stripping agents used in this methodology during washing or neutralizing shall be completely cleaned before the waste dries.

a. Each worker, in order to be allowed in the work area, must have received specific instructions on the procedures to remove material that inadvertently comes in contact with skin, and eyewashing procedures, together with information on the nature of the danger. This can be accomplished by general safety meetings that are regularly scheduled and with a "right-to-know" booklet that is in a location that is known to all persons and is readily accessible.

b. In addition to standardized work area preparation, to protect surrounding areas, polyethylene sheeting shall be placed flush to the surrounding walls for a firm seal to avoid leakage of waste below the polyethylene sheeting, and the joint shall be caulked. The Abatement Subcontractor may place absorbent pads or material below the surface being abated and/or place waterproof duct tape on the surface adjacent to that being abated, to prevent damage to the adjacent wall or floor surface. The Abatement Subcontractor is responsible for repairing any adjacent surfaces harmed by the chemical removal process. This includes contamination of these surfaces by chemical residue.

c. A dwell time may be a specified by the manufacturer. The Subcontractor shall run a series of test patches to determine the optimal amount of time for the chemical to work on a particular component.

d. Removal of the caustic stripping agent after dwell time shall be performed by scraping the waste off the substrate onto the paper, using a metal scraper. Application process shall be repeated if, in the opinion of the Consultant, complete removal of the paint is not attained. At no time shall dry scraping be used.

e. Once removal of paint from the abated surface is complete, clean-up procedures shall then follow and include wash-down of the surface and neutralization.

f. Once the neutralizing process is complete, the surface shall undergo normal clean-up

procedures of HEPA vacuuming, wet wash and repeated HEPA vacuuming.

g. All worker protection equipment as specified shall be left within the work area during all phases of the work. This equipment may be transferred between work areas using double six (6) mil polyethylene bags to prevent contamination of clean areas.

h. All accumulated debris resulting from removal of caustic paste shall be treated as hazardous and shall be properly stored and disposed of according to EPA, DOT, and all other applicable federal, state, and local regulations.

i. Any wood flooring contaminated by the absorption of lead caustic shall be replaced by the Abatement Subcontractor at his/her expense.

B. Application and Removal

1. Spray or hand trowel paste according to manufacturer's specifications (no less than ¼" thick). The caustic stripping agent should be applied with recommended special spray equipment approved by the manufacturer to ensure proper application of product, if spray application is used.

a. During spray application no more than two workers (one person applying and one helper) shall be allowed in the work area. Security of work area is absolutely essential.

2. Never remove material with personnel below, or in a manner that would allow caustic to fall on, splatter or contact personnel in the vicinity of the removal.

- Minimize the fall distance of the paste/paint.

3. Work area shall be properly heated so as to meet temperature requirements outlined in the manufacturer's specifications. Heating procedures shall be subject to the approval of the Consultant and Owner, and shall be supplied by the G.C.

4. Abatement Subcontractor shall make certain that during the application, dwell time and removal of caustic paste, the work area is secured.

C. Clean Up

1. Collect caustic paste cloth with paste/paint along with remaining residue and put into six (6) mil polyethylene bags and dispose of in compliance with all regulations and specifications.

2. Spray surface lightly with water spray. Then with a nylon scrub brush, agitate surface to loosen all residue. Thoroughly scrub surface, being sure to get all crevices, grooves, cracks, etc.

3. Lightly spray clean water on surface, removing remaining residue. The use of a wet vacuum to assist in the clean-up is suggested. Make certain that entire surface is clean of any paint/paste residue.

4. Treat residue (paste, paper, water, etc.) as hazardous waste until results of TCLP tests are available. Disposal will be dependent upon these results.

D. Neutralization

1. Apply caustic stripping agent neutralizer in accordance with manufacturer's recommendations. Wash neutralizer off with clean water, per manufacturer's recommendations.

2. Apply second application of caustic stripping agent neutralizer if needed and allow to dry. After one to three (1-3) hours, wash neutralizer off with clean water and allow surface to dry completely.

3. Abatement Subcontractor should use pH paper to determine if neutralization is adequate. A dry surface showing a pH of between 6 and 8 after the proper drying out period, is ready to be recoated. A pH over 8 should be treated to another application of neutralizer and left to dry before retesting. It is most important that the surface properly dry out before recoating.

3.7.4 Caustic Paint Specific Component Substrate

A. The following shall be used as a guide by which certain specific components/substrates will be abated through the use of caustic pastes. Any specific component/substrate not herein mentioned, but so identified and designated, shall be abated according to manufacturer's recommendations. The exact locations of specific surfaces to be abated by this method are listed in Section 3.0.

1. Removal of Paint from Bulkheads. Paint shall be removed from all bulkheads in place. Special care must be taken to remove all paint from hinge mortises and frame to wall joints. A prefabricated plastic or metal drip pan may be placed on the floor at the junction of the bulkhead frame on top of any protective polyethylene sheeting. Drip pans may be placed at all sides of the bulkhead frame and abut the frame to create a seal to prevent leakage of the caustic paste below the work area seal. The drip pan shall be large enough to contain all leakage.

2. Removal of Paint from Round Vents

(a) Paint shall be removed from round vents as identified in Section 3.0. All paint shall be removed from entire surface on both sides.

3. Removal of Paint from Stair Railings System

(a) Paint shall be removed from railings, posts, guards, balusters, and all other metal stair surfaces.

(b) Paint shall be removed from the underside of flat surfaces of the railings, guards, or other surfaces.

(c) Great care shall be taken to prevent caustic paste from leaching into concrete landings utilizing work practices previously described.

(d) Each railing system shall be prepared for abatement by sealing off dwelling unit entrance doors. Waterproof tape shall be applied to every door at all seams. Each door shall then be covered with two layers of six-mil polyethylene sheeting and sealed to the door frames to create an airtight seal.

4. Removal of Paint from Window, Door, Vent, and Canopy Flashing, and Lintels

(a) Paint shall be removed from all visible metal surfaces of the window/door flashing and lintels as identified in Section 3.0.

(b) Caustic remover shall not come in contact with anodized aluminum windows.

(c) Work shall be performed only when weather conditions permit.

(d) If chemical is left on overnight, a barrier tape shall be erected and maintained until the chemical is removed.

3.8 DAILY CLEANUP

At the completion of each workday, the Abatement Subcontractor shall clean the inside of the work area. At a minimum, the following procedures shall be adhered to:

3.8.1 Cleaning

A. End of Day Cleaning. Thirty (30) minutes or more if necessary prior to the end of each work day, the lead work area must be cleaned of all debris. Under no circumstances will lead clean-up be permitted when active lead paint abatement work is proceeding. All abatement activity must cease during the cleanup period.

Such cleaning shall include a thorough HEPA vacuuming of all affected surfaces, as determined by the Consultant. Additionally, cleaning requires the use of a solution of five percent tri-sodium phosphate (TSP) or other equally effective cleaning agent. All waste materials generated during this daily clean-up shall be disposed of as hazardous waste, unless analytical testing proves otherwise.

B. Equipment Cleaning. Durable equipment, such as power and hand tools, generators, and vehicles shall be cleaned at least monthly or prior to removal from buildings undergoing abatement or the site. All equipment shall be cleaned by HEPA vacuuming and high-phosphate (tri-sodium phosphate) washing (or use of an equivalent cleaner).

1. High Efficiency Particulate Air (HEPA) vacuum: The Abatement Subcontractor will obtain training in the use of the HEPA vacuum from the manufacturer prior to use and submit evidence of this training to the Owner and Consultant. The Abatement Subcontractor shall obtain HEPA vacuum attachments, such as various size brushes, crevice tools, and angular tools to be used for varied applications and service the HEPA vacuum routinely to assure proper operation. Caution shall be used any time the HEPA is opened for filter replacement or debris removal. Operators shall wear a full set of protective clothing and equipment, including respirators, when using and emptying the HEPA vacuuming equipment.

C. Preliminary Clean-Up. Upon completion of the lead paint abatement and a satisfactory visual inspection by the Owner/Consultant in a given work area, a preliminary clean-up shall be performed by the Abatement Subcontractor. This clean-up includes removal of any contaminated material, equipment or debris including polyethylene sheeting from the work area, except for critical barriers. The polyethylene sheeting shall first be sprayed or misted with water for dust control, the resulting abatement debris removed, then the sheeting shall be folded in upon itself. All polyethylene sheeting used for critical barriers shall remain in place until final clearance testing results have passed the clearance criteria set forth herein.

1. Large Debris. Large debris from demolition (i.e. doors, windows, baseboards) shall be wrapped in polyethylene sheeting at least six-mil thick, sealed with heavy duty duct tape, and stored until proper disposal.

2. Small Debris. Prior to picking up or collecting small debris, the surfaces of this debris will be sprayed with a fine mist of water. The debris will be picked up, collected and placed into a single plastic bag, at least six-mils thick. The bags shall not be overloaded, shall be securely sealed, and shall be stored in the designated area until disposal. Dry sweeping is not permitted in the work area; wet sweeping will require approval by the Consultant.

3. Sheeting. Removal of surface six-mil polyethylene sheeting shall begin from upper levels, such as on cabinets, counters or shelves. Removal of floor polyethylene sheeting shall begin at the corners and folded into the middle to contain the dust or residue. All collected polyethylene sheeting shall be placed in six-mil polyethylene bags for proper disposal as described in this Specification.

4. HEPA Vacuuming. Once the six-mil polyethylene sheeting is removed from the work area, cleaning shall begin with a thorough HEPA vacuuming of all surfaces, starting at the ceilings, proceeding down the walls and including window, doors and door trim and floor. The floor shall be vacuumed last, beginning at the farthest corners from the entrance to the work area. HEPA vacuuming shall again be performed as noted above, after the following TSP wash.

5. TSP Wash. Abatement Subcontractor shall next wash or mop the same surfaces with a tri-sodium phosphate (TSP) detergent solution (five percent) or other equally effective cleaning agent and allow surfaces to dry. Then a second HEPA Vacuuming of the surfaces will be performed by the Abatement Subcontractor, as described above. By the conclusion of the cleaning phase, all visible dust and debris shall have been completely removed.

6. Hygiene, Cleaning Equipment and Supplies. Special attention shall be given to personal hygiene and the cleaning of supplies and/or equipment. All mop heads, sponges and rags shall be replaced or changed daily, at a minimum. Rags, mop heads or sponges may be reused if Abatement Subcontractor has them cleaned via a washing system specially equipped with HEPA filtration.

7. Detergents. The Abatement Subcontractor shall prepare and use detergents containing five to ten percent TSP according to the manufacturer's instructions. The manufacturer's recommended coverage will be followed. The waste water from clean up shall be contained and disposed of according to all applicable Federal, state, county and local regulations and guidelines. In no instance shall waste water be disposed in storm sewers (e.g., yard inlet or street drain) or sanitary sewers (e.g., toilet, sink, or any other household/residential/commercial type drain system) without specific governmental approval.

3.9 VISUAL INSPECTIONS

The Abatement Subcontractor shall request a visual inspection by the Owner or Consultant. If the area does not pass a visual inspection (e.g., no visible dust or debris), the Abatement Subcontractor shall reclean the area as outlined in Steps 4, 5, 6, and 7 in Section 3.8(c).

3.9.1 Post-abatement Visual Inspection. The Consultant shall confirm job completeness by determining whether all surfaces have been abated according to the approved abatement plan and project specification. The Consultant will then determine if the building has been adequately cleaned by examining all surfaces for dust and debris. If dust is found, the work area should be recleaned, and the damp cloth test repeated.

3.9.2 Post-abatement Clearance. When all surfaces have passed visual inspection, wipe samples as detailed in Section 3.8.4 (1) shall be performed by the Consultant. The standards for passing a wipe test are outlined in Section 3.8.4 (2). Should laboratory results indicate that the wipe test clearance level is exceeded, the Abatement Subcontractor shall re-clean the affected area, at no additional cost to the Owner, utilizing the methods specified above. Retesting will then be performed to verify compliance with the mandated levels. Abatement Subcontractor shall pay for all additional testing and provide, at no additional cost, a recleaning of an effected area and personal belongings until the clearance level is achieved.

3.9.3 Finish Coatings. Finished coatings including, but not limited to, stains, primer, sealers and polyurethane coatings, if used, shall only be applied upon approval by the Owner/ Consultant. Any surface requiring painting shall be primed with an approved primer. All primers or finish coating materials shall have labeling stating, in equal or appropriate wording, "does not contain lead-based paint greater than 600 parts per million" (0.06%) and "does not contain mercury." In lieu of label wording, a manufacturer's statement to this effect may be substituted.

3.9.4 Inspection/Clearance Standards. When clean-up has been completed and all surfaces have been final cleaned, wipe samples by the Consultant or Industrial Hygienist will be performed. The following standards must be met for all "clearance" requirements:

3.9.4.1 Wipe Tests

When only some component types are to be sampled in a specific area, the Consultant will ensure that the component types to be sampled are randomly selected. Within an area, the specific components to be sampled shall be selected at random and the specific sample location on a large component shall be selected at random.

In order to compare results with applicable federal clearance criteria, the following methods must be used.

A. The sampling location (a specific surface area) must be selected, and the surface area of that location carefully measured and recorded.

B. The wipe sampling procedure must ensure that a very high percentage of the surface dust present on the sample location is captured on the wipe.

C. Wipe sample collection criteria for abatement shall be as follows:

Step-by-Step Summary

Clearance: How To Do It

1. Decide who will conduct clearance. Clearance on all abatement projects and federally funded interim control work must be done by a certified risk assessor or inspector technician. The U.S. Department of Housing and Urban Development (HUD) strongly recommends the use of a certified risk assessor or inspector technician who is completely independent of the lead hazard control contractor to eliminate conflicts of interest. Some local jurisdictions may require a license to conduct clearance.

2. Finish the lead hazard control and cleanup effort. Seal floors before clearance testing (if necessary).

3. Wait 1 hour to allow any airborne dust to settle. Do not enter the room during that hour.

4. Conduct visual examination.

   a. Determine if *all* required work has been completed and *all* lead-based paint hazards have been controlled.

   b. Determine if there is visible settled dust, paint chips, or debris in the interior or around the exterior.

5. Complete the Visual Clearance Form contained in this chapter; if all specified work was not completed, inform the owner and order completion of work and repeated cleanup, if necessary.

6. Conduct clearance dust sampling of floors, interior window sills, and window troughs using the protocol in this chapter.

7. Conduct clearance soil sampling if bare soil is present that was not sampled previously, or if exterior paint work was completed as part of the lead hazard control effort.

8. Complete the Dust and Soil Sampling Clearance Form contained in this chapter.

9. Submit samples to an Environmental Protection Agency (EPA) recognized laboratory participating in the National Lead Laboratory Accreditation Program for analysis.

10. Interpret results by comparing them to the HUD Interim Clearance Standards contained in this chapter (until EPA issues its health-based leaded dust standards).

11. If clearance is achieved, go to step 15.

12. Order repeated cleaning if results are above applicable standards. Clean all surfaces the sample represents. If both window and floor samples fail, the entire unit must be recleaned.

13. Continue sampling and repeated cleaning until the dwelling achieves compliance with all clearance standards.

Step-by-Step Summary (continued)

14. Complete any related construction work that does not disturb a surface with lead-based paint (all work that does disturb painted surfaces or that could generate leaded dust should be completed as part of the lead hazard control effort).

15. Issue any necessary certificates of lead-based paint compliance or releases and maintain appropriate records.

16. Permit residents into the cleared work area.

Clearance criteria shall be as follows:

Surface	Leaded Dust Loading ($\mu g/ft^2$) (micrograms per square foot)
	Wipe Only
Floors	100
Interior Window Sills (Stools)	500
Window Troughs	800
Exterior Concrete Or Other Rough Surfaces	800

3.9.4.3 Retests. Should laboratory results indicate that the wipe test clearance level is exceeded, the Abatement Subcontractor shall reclean the affected area, at no additional cost to the Owner, utilizing the methods specified above. Retesting will then be performed to verify compliance with the mandated levels. Abatement Subcontractor shall pay for all additional testing and provide, at no additional cost, a recleaning of an affected area until the clearance level is achieved.

3.9.5 Inspections. In addition to various daily inspections of the lead work area and abatement practices, the Consultant will make four (4) mandatory inspections during the work, one during each phase of removal. Each inspection must be requested by the Abatement Subcontractor to be performed by the Consultant to the Consultant's satisfaction before work may begin for next phase of work, or an area accepted. Failure on the part of the Abatement Subcontractor to obtain the Consultant's approval before proceeding to the next scheduled phase is regarded as a violation of this section. In the event of this occurring, Consultant will request work be stopped and Owner will be contacted to intervene. The four (4) inspections are as follows:

1. Window and Door Barrier Completion. Abatement Subcontractor shall have all pre-abatement preparations of the work area complete, as described in Sections 3.1.

2. Post Removal Inspection. Abatement Subcontractor shall have completed abatement and final clean-up of all visible debris and perform final cleaning techniques of TSP washing and HEPA vacuuming as described in Section 3.8.

3. Daily Clean-up. Abatement Subcontractor shall have completed daily cleanup as defined in Section 3.7.

4. Final Clearance. Consultant will perform final clearance wipe testing 24 hours after final clean-up activities are completed as described in Section 3.9.

3.9.6 Air Sampling Procedure

Air sampling shall be conducted by the Consultant. Samples shall be collected and analyzed for total airborne lead. Air sampling will be collected during, but not limited to, the pre-abatement and post-abatement periods.

A. Sampling Apparatus. Air Sampling shall be collected utilizing a closed-face, 37 millimeter cassette. A mixed cellulose ester filter with 0.8 micrometer pore size with a cellulose support pad shall be placed in the cassette. Air sampling pumps shall be calibrated at 2.0 liters per minute prior to sampling. All pumps shall be post calibrated.

B. Analytical Method. The NIOSH 7082 (AAS) procedure shall be used for sample analysis. A blank filter shall be submitted with each set of samples.

3.9.7 Data Reporting for Lead in Air

Laboratory results for air samples shall be provided in micrograms of lead per cubic meter of air.

Information specific to obtaining the air samples should be listed on a separate data form for air samples, which would include the following:

A. Location where sample was taken
B. Length of time in use
C. Approximate volume of air sampled
D. Abatement/clearance status
E. Abatement method (e.g., removal vs. enclosure)

3.9.8 Analytical Laboratory Qualifications

Analytical laboratories must be recognized by the EPA as participating in the National Lead Laboratory Accreditation Program (NLLAP). The Laboratory must show evidence that it is proficient in lead analysis under the Environmental Lead Proficiency Analytical Testing Program. If the laboratory is not currently enrolled in these programs, the laboratory will be required to enroll in the next round of ELPAT samples. The laboratory must be accredited within a one year period by an organization recognized by NLLAP that has signed a Memorandum of Understanding with EPA. Currently, the American Industrial Hygiene Association (703-849-8888) and the American Association for Laboratory Accreditation (301-670-1377) have signed such memoranda of understanding with EPA.

1. All dust, paint, and soil samples shall be analyzed for total lead, not "bioavailable" lead, as required in the HUD Guidelines for Evaluation and Control of Lead-Based Paint in Housing.

2. The following procedure (or equivalent) shall be employed for the analysis of the wipe samples:

Remove and unfold the wipe from the shipment container. Cut the wipe into small pieces and place in a 125 ml Phillips beaker. Quantitatively rinse the shipment container into the Phillips beaker. Cover the wipe with 10 ml of distilled water. Add 2 ml of concentrated HNO3 and 2 ml of HC1. Gently heat for 20-30 minutes under reflux. Cool and transfer both the liquid and the bulk material left to a 50 ml volumetric flask. If there is too much bulk material left over, rinse with distilled water and squeeze with a glass rod. Add distilled water to make up to final volume. Prior to analysis by AA or ICP, an aliquot is filtered through ashless filter paper, then centrifuged at 9K rpm for 20 minutes. The supernatant liquid is drawn off and analyzed.

3.9.9 Qualifications of Sampling Personnel

All personnel conducting environmental sampling for this project should be certified as a lead-based paint inspector, risk assessor, or inspector technician or equivalent by the Environmental Protection Agency or the appropriate state agency, or be under the supervision of such a person. Certified Industrial Hygienists are not required to have additional certification as a lead-based paint inspector.

3.10 DISPOSAL OF WASTE MATERIAL

3.10.1 Caution Note for Contractors:

All materials, whether hazardous or non-hazardous, shall be disposed of in accordance with all laws and the provisions of this Section and any or all applicable federal, state, county, or local regulations and guidelines. It shall be the sole responsibility of the Qualified Abatement Subcontractor to assure compliance with all laws and regulations relating to this disposal. Until analytical results are available, all waste materials (including water) shall be segregated and treated as hazardous.

A. Applicability. Initial TCLP results have been used to classify waste into six categories. The categories are defined by the substrate type and the amount of the six toxic metals regulated by RCRA and most commonly found in paint.

B. Waste Segregation - The Abatement Subcontractor shall be responsible for segregating waste in accordance with the previously defined six categories. Separate waste dumpsters shall be used for each of the six categories. Prior to disposal of each dumpster of waste, a representative sample will be collected by the on-site inspector, paid for by the abatement Subcontractor and analyzed by TCLP for the RCRA metals. The result of each TCLP analysis will dictate the disposal requirement for each dumpster. Unit prices listed in Section xxx shall be utilized to compensate for additional disposal cost associated with disposing of materials as hazardous waste.

C. Component Classification - The initial TCLP results have been used to establish the following waste segregation categories:For bidding purposes Categories I and IV shall be considered construction waste. Categories II, III, V, and VI shall be considered hazardous waste.

Wood Substrates

a. Category I

Residential windows without putty
Corner boards
Basement window sills
Wood Gutter
Thresholds

b. Category II

Attic Vent
Entrance door jamb
Entrance door header
Wood shingle
Entrance door casing
Canopy components
Trellis
Clapboard siding
Toeboards
Basement window with putty
Residence window with putty
Basement window without putty
Caulks and Sealant

c. Category III

Entrance door
All exterior trim
Soffit
Metal Substrates

d. Category IV

no components listed

e. Category V

Electrical Conduit
Metal flashing
Miscellaneous metals i.e., hooks, brackets

f. Category VI

Copper downspouts

D. Disposal Requirements. The Abatement Subcontractor shall contact the Regional EPA, state, local, and all other pertinent authorities to determine lead-based paint debris disposal requirements. If applicable, the requirements of the Resource Conservation and Recovery Act (RCRA) must be complied with, as well as any or all other applicable federal, state, county, or local waste requirements.

The Owner/Consultant will supply the Abatement Subcontractor with a list of some of the appropriate agencies. During or after the actual abatement, the Abatement Subcontractor shall not leave any debris in the yard or near-by property, incinerate debris, dump debris by the road, place debris in any unauthorized dumpster, or introduce lead contaminated (non-filtered) water into storm sewers (shall not be poured down yard inlet or street drain) or sanitary sewers (shall not be flushed down toilet or any other household/residential/commercial type drain system). All waste water shall be labeled "filtered" (using 5 micron filter) or "non-filtered." All non-filtered waste water containers shall be labeled "hazardous waste" and with a date the Abatement Subcontractor began to collect contaminated water in that container.

E. EPA ID Numbers. The Abatement Subcontractor shall apply for an EPA identification number from the appropriate office; if more than 100 kg of hazardous waste will be generated from the abatement process during any calendar month. If less than 100 kg is to be generated, the Abatement Subcontractor shall obtain a Small Quantity Generator RCRA Hazardous Material ID number. The Consultant will assist the chosen Abatement Subcontractor in contacting the appropriate office to secure the identification number. The Abatement Subcontractor also has the responsibility to coordinate this action through the State and secure any additional number as required.

The following testing must be performed by a laboratory properly certified by the State of State. The name of the laboratory must be supplied to the Owner/Consultant prior to the initiation of the testing.

F. TCLP Test. Testing on lead-based paint abatement waste materials by use of the Toxicity Characteristic Leaching Procedure (TCLP) will be completed and paid by the Abatement Subcontractor, and results shall be supplied to the Consultant and Owner. Testing results on most building components have been performed by the Consultant and are attached to this contract specification.

G. Testing of Materials. The testing of material shall be performed as obtained to minimize the storage of "assumed" hazardous material. In absence of written official state guidance, the Abatement Subcontractor shall take at least one (1) composite sample of the items listed below for the RCRA eight (8) heavy metals. The Abatement Subcontractor shall also determine if additional testing for other compounds, such as pH, flashpoint, etc., are required for disposal at a particular landfill. The following materials shall be tested to determine whether or not they are hazardous:

1. Waste water.
2. Dust from HEPA filters.
3. Metals that have not been previously tested.

4. Plastic sheets, duct tape, or tape used to cover floors and other services during the lead-based paint removal.
5. Solvents and caustics used during the stripping process.
6. Liquid waste, such as wash water used to decontaminate wood after solvents have been used, and liquid waste from exterior (or interior) water blasting.
7. Rags, sponges, mops, scrapers, and other materials used for testing, abatement, and clean-up.
8. Disposable work clothes and respirator filters cartridges.
9. Any other items contaminated with lead-based paint or items produced as a result of lead-based paint abatement activity, such as the water filters.

H. Storage Requirements. Any item found to be hazardous, by way of testing, shall be kept in a secured area or lockable container that is inaccessible to all persons other than abatement personnel. All hazardous waste shall be labeled "Hazardous Waste - Contains Lead" and a date that the Abatement Subcontractor began to collect waste in that container. All hazardous and non-hazardous waste shall be kept in totally and completely separate containers. Until TCLP testing proves an item to be non-hazardous, all items shall be considered hazardous and stored in a secured area or lockable container.

I. Regulations. The Abatement Subcontractor will be required to comply with the Resource Conservation and Recovery Act (RCRA) and/or any other applicable state, county law, regulation and/or guidelines, whichever is most stringent.

J. Waste Transportation. If the Abatement Subcontractor is not a RCRA/DOT/EPA certified Hazardous Waste Transporter, a contract shall be entered into with a certified transporter to move the waste. The Abatement Subcontractor shall require the certified hazardous waste transport firm to follow RCRA, DOT, EPA, and any/all other applicable regulations. Many transporters are also capable of supplying pertinent information and services applicable to necessary rules, regulations, and specifications. The certified transporter/hauler shall submit for Owner/Consultant approved their qualifications to perform the work as specified herein. The Abatement Subcontractor shall be responsible for all actions of the waste hauler as pertaining to waste removal and disposal under this Section and all EPA, DOT, and other applicable regulations.

1. The Abatement Subcontractor must supply documents that detail the site(s) to be used for ultimate waste disposal. Documents from these disposal sites must be supplied by the Abatement Subcontractor to the Owner/Consultant from the disposal facilities stating that hazardous and/or construction waste will be accepted by these facilities. In addition, the Abatement Subcontractor must submit documents from these sites proving that they are licensed/permitted to accept such waste and will accept the waste proposed by the Abatement Subcontractor for treatment or ultimate disposal.

K. Waste Containers. The Abatement Subcontractor will comply with EPA and DOT regulations for waste containers. The Abatement Subcontractor shall contact the state and local authorities to determine their criteria for containers. In the case of any conflict in regulations, the more stringent regulation shall apply.

L. Emergencies. Abatement Subcontractors shall: contact local fire, police, hospitals or local emergency response teams and inform them of the type of hazardous waste activity and ask for assistance in the event of an accident; keep and properly maintain a suitable fire extinguisher(s) on site; have an immediate means of communication with a regulatory agency in the event of an emergency; keep a list of phone numbers of regulatory agencies on site, make sure all employees know how to deal with all types of accidents; make one person who is always on site, when the site is occupied, the emergency coordinator to ensure that emergency procedures are carried out in the event an emergency arises; and keep and maintain a "right to know" manual that is in an easily accessible location and in an area that is known to all employees.

M. Disposal Packaging. The Abatement Subcontractor shall place lead-based paint fragments and debris produced as a result of any abatement activity and lead dust in six-mil polyethylene (plastic) bags that are air-tight and puncture-resistant.

1. Cleaning Materials. The Abatement Subcontractor will place all disposable cleaning materials such as sponges, mop heads, filters, disposable clothing, and brooms in six-mil plastic bags. If after testing, those materials are determined to be hazardous, the bags will be sealed, labelled, and considered hazardous waste.

2. Contaminated Debris. In particular, the Abatement Subcontractor shall separate, label, and containerize the following:

a. All paint or paint fragments removed by chemical strippers, surface preparation, or by any abatement methodology;
b. Grossly contaminated body suits;
c. HEPA vacuum contents, filters, and respirator cartridges: paint chips or other abatement debris on plastic should always be HEPA vacuumed prior to picking up the plastic.
d. All hazardous wastes or materials should be kept totally separate from non-hazardous materials.

3. Polyethylene Sheeting. The Abatement Subcontractor shall clean surfaces and equipment and containerize large debris. Prior to removing any six (6) mil polyethylene sheeting, the Abatement Subcontractor shall lightly mist the sheeting in order to keep dust down and remove and containerize any debris and fold six (6) mil polyethylene sheeting inward to contain debris and to form tight bundles to containerize for disposal. The Abatement Subcontractor shall place all plastic sheeting in six (6) mil thick polyethylene bags and seal.

N. Removing and Transporting Waste

1. Vehicles. The Abatement Subcontractor shall ensure that all non-hazardous waste is transported in covered vehicles to a landfill, or lined landfill, if required.

2. Container Handling. The Abatement Subcontractor shall carefully place the containers into the truck or dumpster used for disposal. At NO time will debris or containers be thrown or dropped.

3. Dust or Debris. If the Abatement Subcontractor subcontracts the removing of the non-hazardous lead-based paint abatement waste, the Contractor shall ensure that the company removing the waste material adequately covers all loads so as to assure that no dust or debris is released.

4. Liquid Wastes. The Abatement Subcontractor shall contain and properly dispose of all liquid waste, including lead-contaminated wash water if not filtered and drained.

5. Containers. The Abatement Subcontractor shall HEPA vacuum the exterior of all waste containers prior to removing the waste containers from the work area and shall wet wipe the containers to ensure that there is no residual contamination. Containers should then be moved out of the work area into the designated storage area.

6. Solvents. The Abatement Subcontractor shall place solvent residues and residues from strippers in drums made out of materials that cannot be dissolved or corroded by chemicals. Solvents will be tested by the Abatement Subcontractor to determine of they are hazardous. Solvents, caustic, and acid waste must be segregated and not stored in the same containers.

3.10.2 Soil Sampling Procedure

A. Pre-abatement Soil Sampling. In order to establish baseline lead-in-soil conditions on the site prior to the initiation of exterior lead abatement, soil samples will be collected.

3.10.3 Post-abatement Soil Sampling

A. Post-abatement soil samples, will be collected at the same building where pre-abatement soils samples were collected.

B. If pre-abatement soil samples at any of the ten building locations exceed 1,000 µg/g, the Contractor may be required to perform soil excavation and removal at additional cost as specified in Section 3.10.4.

C. If pre-abatement soil samples are at or below 1,000 µg/g, and post-abatement soil samples exceed 1,000 µg/g, the Contractor will be required to perform soil excavation and removal at no additional cost as specified in Section 3.10.4 under Section 3.11 Damages.

3.10.4 Excavation and Removal of Contaminated Soil

A. Careful excavation will begin with equipment, such as an excavator or backhoe. Work will continue with hand tools as directed by the Consultant. Careful handling of soil with hand tools shall be employed in order to avoid damaging the structure and to minimize waste generation.

B. Excavation to a depth of two (2) inches will take place within the area identified by the Consultant.

C. Excavation will be performed with care to protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by equipment, contaminated soil, and other hazards created by operations.

D. Excavated soils will be placed in a pre-designated area on six (6) mil polyethylene roll sheeting and covered with the same material.

E. Proper protective measures will be taken to prevent human exposure to excavated soils. Protective measures shall include installation of construction fencing around excavated soil and staking or weighting polyethylene sheeting to prevent wind or precipitation damage.

F. Careful removal of contaminated soil will begin with equipment, such as an excavator or pay loader. Work will continue until all contaminated soil is removed from the area outlined on the site plan to the specified depth.

G. Appropriate worker protection practices shall be followed as specified in OSHA Regulations.

3.10.5 Laboratory Testing for Lead in Soil

Pre-abatement and post-abatement soil lead analysis will be performed. EPA protocols for soil sampling will be followed

3.11 DAMAGES

The Abatement Subcontractor shall protect remaining surfaces such as drywall, paneling, plaster, glass, and the property soil, etc., from damage. Damages to non-protected remaining surfaces shall be repaired at the Abatement Subcontractor's expense. Random background soil samples will have been obtained by the Consultant. Results will be supplied without specifying their location. The Abatement Subcontractor is responsible for damages if the property soil becomes further contaminated. Reference is made to Section 3.10.1 and 3.10.2.

3.12 REOCCUPANCY CRITERIA

During all stages of the exterior abatements, dwelling units will be reoccupied after final cleanup and visual inspection completed by the Consultant at the end of each work day. Two sets of post-abatement wipe samples analyzed by atomic absorption spectroscopy (AAS) will be collected for confirmatory purposes. A comparison will be made with pre-abatement wipe samples collected prior to abatement. If the two sets of results are not statistically different, occupancy shall be maintained. However, if a unit is cleared and re-occupied based on the Consultant's visual inspection and it then fails to meet the clearance criteria based on the laboratory results, the cost of the cleaning of the occupants' household furnishings will be borne by the Abatement Subcontractor. U.S. HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing will apply for lead wipe results.

Appendix 8
Example of a Risk Assessment Report

This Appendix provides examples of lead-based paint risk assessment reports in two types of settings: a single-family rental dwelling operated by a small-scale owner (Appendix 8.1) and a large multi-family housing development with many similar dwelling units (Appendix 8.2).

Appendix 8.1

Example of a Risk Assessment Report for a Single-Family Dwelling Operated by a Small-Scale Owner

(See Appendix 8.2 for a Multifamily Risk Assessment.)

Part I: Identifying Information:

Lead-Based Paint Risk Assessment Report

For The Dwelling Located at:

1234 Main St.
Anywhere, Any State 300000

Prepared For:

Mr. Joseph H. Smith, Owner
4444 Podunck Way
Anywhere, Any State 300000
400-777-7777

By:

Michael L. Hazard, Certified Assessor
5678 Snowflake St.
Anywhere, Any State 300000
400-333-3333

Any State License No. 94-567

April 19, 1994

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Summary

Part 1: Identifying Information

A lead-based paint risk assessment was conducted at 1234 Main St. in Anywhere, Any State 300000 for Mr. Joseph H. Smith, Owner, who is located at 4444 Podunck Way, Anywhere, Any State 300000 (400-777-7777) on April 1, 1994. The risk assessment was conducted by Michael L. Hazard, a Certified Risk Assessor (Any State License No. 94-567).

Part II: Results

4. List of Location and Type of Identified Lead Hazards

While the building and its paint are in reasonably good condition overall, the risk assessment showed that lead-based paint hazards (as defined in Title X of the 1992 Housing and Community Development Act) exist in the following locations:

a. Deteriorated lead-based paint on the exterior side of the windows.

b. Leaded dust on the floor of Bobby's bedroom (the southeast bedroom on the second floor).

c. Deteriorated lead-based paint on the interior door leading to Bobby's bedroom (the southeast bedroom

A few other painted surfaces that have not been tested for lead are in "fair" condition and should be repainted within the next year before further deterioration occurs. However, these surfaces are not considered to be immediate "hazards," using criteria in the 1995 *HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.* Those surfaces are:

- Exterior Doors
- Exterior Railings
- All Interior Doors (except the bedroom door to the southeast bedroom, which is in poor condition and requires repair immediately)
- Interior window trim
- Stairways
- Bathroom cabinets

Since vacancies occur frequently in this property, these surfaces can be repainted at that time. Before any scraping or sanding, the paint should be tested to see if it contains lead. The paint on the porch floor is in poor condition, but since it does not contain lead-based paint, it does not require priority attention.

There has not been any previous lead-based paint testing at this dwelling, although a lead-based paint inspection of all painted surfaces is recommended so that potential lead problems can monitored before they become hazardous. Soil lead levels were all below 400 µg/g. Current EPA and HUD Guidance for soil is 400 µg/g for bare play areas and 2,000 µg/g for other areas. Using these criteria, soil is not a hazard at this property.

The owner has decided to select the following hazard control measures, which are all acceptable based on HUD's *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*:

- stabilize the paint on the exterior of all the windows
- remove the lead dust located in the child's bedroom
- replace the door leading to the southeast second floor bedroom

Mr. Smith has chosen to use interim controls for the windows until 1997, when the State of Any State is likely to begin a special loan fund for financing lead-based paint abatement that should make window replacement financially possible. Mr. Smith will also make sure that the part-time as-needed maintenance worker he uses will be trained. Certain property management practices will be adopted to ensure that the normal repair work done will not disturb those surfaces with lead-based paint.

After the cleaning and paint film stabilization work has been completed, clearance dust samples must be taken to make certain that the dwelling is lead-safe before the family moves back in to the room.

Reevaluation: Standard Reevaluation Schedule 3 contained in the HUD Guidelines applies to this property, since one of the rooms had a dust lead level greater than the standard. Therefore, the dwelling should be reevaluated in April 1995 (12 months from now). If no lead-based paint hazards are identified at that time, another reevaluation should be conducted in April 1997 (2 years later). If no lead-based paint hazards are identified at that time, no further reevaluations are needed. However, since lead-based paint may be present in the dwelling, the owner should monitor the condition of all painted surfaces at least annually or whenever other information indicates a potential problem.

Mr. Smith has agreed to share the results of this report with the Jones family, which now occupies the residence and to provide the family with the EPA brochure and a brochure from the Anywhere Childhood Lead Poisoning Prevention program as a way of educating the residents.

Form 5.0
Resident Questionnaire

Children/Children's Habits

1. (a) Do you have any children that live in your home?Yes __X___No _____
   (b) If yes, how many?__2___Ages?__1___ __3___ _____ _____ _____
   (c) Record blood lead levels, if known_____ _____ _____ _____ _____

IF NO CHILDREN, SKIP TO Q.5

2. Locate the rooms/areas where each child sleeps, eats, and plays.

Name of Child	Location of Bedroom	Location of All Rooms Where Child Eats	Primary Location Where Child Plays Indoors	Primary Location Where Child Plays Outdoors
Bobby	Southeast - Second Floor	Kitchen	Living Room	Back Yard Under Jungle Gym
Jennifer	Southwest - Second Floor	Kitchen	Living Room	Back Yard Under Jungle Gym

3. Where are toys stored/kept?____Living Room_____
4. Is there any visible evidence of chewed or peeling paint on the woodwork, furniture, or toys? Yes _____No __X___

Family Use Patterns

5. Which entrances are used most frequently?___Front Door_____
6. Which windows are opened most frequently?___Living Room_____
7. Do you use window air conditioners? If yes, where?_____No____X_____
   (Condensation often causes paint deterioration)
8. (a) Do any household members engage in gardening?Yes _____No __X___
   (b) Record the location of any vegetable garden.__No garden_____
   (c) Are you planning any landscaping activities that will remove grass or ground covering Yes_____No __X___
9. (a) How often is the household cleaned?once/week_____
   (b) What cleaning methods do you use? mopping and sweeping___
10. (a) Did you recently complete any building renovations?Yes _____No __X___
    (b) If yes, where?_____
    (c) Was building debris stored in the yard? If Yes, Where?_____
11. Are you planning any building renovations? Where?_____No_____
12. (a) Do any household members work in a lead-related industry?Yes _____No __X___
    (b) If yes, where are dirty work clothes placed and cleaned?_____

Form 5.6
Management Data For Rental Dwellings

Part 1: Identifying Information

Identifying Information:

Name of Building or Development Not Applicable
Number of Buildings ____1_____
Number of Individual Dwelling Units/Building: ____1___
Number of Total Dwelling Units: ___1____
Date of Construction 1937(If between 1960 - 1978, consider a Screen Risk Assessment)
Date of Substantial Rehab, if any None

List of Addresses of Dwellings (attach list if more than 10 dwellings are present)

Dwelling No.	Address	No. Children Aged 0 - 6 Years Old	Recent Code Violation Reported by Owner?	Chronic Maintenance Problem?
1	1234 Main St. Anywhere,Any State	2	No	No

Record number and locations of common child play areas (on-site playground, backyards, etc.)

Number 1 Play Structure In Back Yard

Part 2: Management Information

1. List names of individuals who have responsibility for lead-based paint. Include owner, property manager (if applicable), maintenance supervisor and staff (if applicable) and others. Include any training in lead hazard control work (inspector, supervisor, worker, etc.) that has been completed. Use additional pages, if necessary.

   This information will be needed to devise the risk management plan contained in the risk assessor's report.

Name	Position	Training Completed (if none, enter "None")
Joseph Smith	Owner	None
Not Applicable	Property Manager	
Joe Sweat	Maintenance Worker	None

2. Has there been previous lead-based paint evaluations?
   ____ Yes ___X____ No (If yes, attach the report)

3. Has there been previous lead hazard control activity?
   _____ Yes ___X___ No (If yes, attach the report)

4. Maintenance usually conducted at time of dwelling turnover:
   Repainting:_____Where needed_____
   Cleaning:_____Where needed_____
   Repair: _____Where needed_____

5. Employee and Worker Safety Plan

   a. Is there an occupational safety and health plan for maintenance workers?
      _____ Yes ___X___ No (If yes, attach plan)

   b. Are workers trained in lead hazard recognition?
      _____ Yes ___X___ No If yes, who performed the training?
      _____

   c. Are workers involved in a hazard communication program?
      _____ Yes ___X___ No

   d. Are workers trained in proper use of respirators?
      _____ Yes ___X___ No

e. Is there a medical surveillance program
_____ Yes ___X___ No

6. Is there a HEPA Vacuum available?
_____ Yes ___X___ No

7. Are there any on-site licensed or unlicensed day-care facilities.
_____ Yes ___X___ No If yes, give location _____

8. Planning for Resident Children with Elevated Blood Levels

a. Who would respond for the owner if a resident children with an elevated blood lead level was identified?
The owner

b. Is there a plan to relocate such children?
_____ Yes ___X___ No If Yes, Where? _____

c. Do you (the owner) know if there ever has been a resident child with an elevated blood lead level?
_____ Yes _____ No ___X___Unknown

9. Owner Inspections

a. Are there periodic inspections of all dwellings by the owner?
___X___ Yes _____ No If Yes, how often? Every year or whenever the unit is vacant

b. Is the paint condition assessed during these inspections?
___X___ Yes _____ No

11. Have any of the dwellings have ever received a housing code violation notice?
_____ Yes __X____ No _____ Unknown If yes, describe code violation
_____
_____

12. If previously detected, unabated lead-based paint exists in the dwelling, have the residents been informed? _____ Yes _____ No ___X__Not Applicable

Form 5.7
Maintenance Data for Rental Dwellings

Recorded during onsite investigation

1. Condition of Paint on Selected Surfaces

Building Component	Paint Condition (Intact, Fair, Poor, or Not Present) To Be Completed by Risk Assessor	Deterioration Due to Friction or Impact?	Deterioration Due to Moisture?	Location of Painted Component with Visible Bite Marks
Building Siding	Intact			
Exterior Trim	Intact			
Window Troughs	Poor	No	No	
Exterior Doors	Fair	Yes	No	
Railings	Fair	Yes	No	
Porch Floors	Poor	Yes	No	
Other Porch Surfaces	Intact			
Interior Doors	Fair (Door to Southeast Bedroom is Poor)	Yes	No	
Ceilings	Fair		No	
Walls	Intact			
Interior Windows	Fair	Yes	No	
Interior Floors	Fair	Yes	No	
Interior Trim	Intact			
Stairways	Fair	Yes	No	
Radiator (Or Radiator Cover)	Intact			
Kitchen cabinets	Intact			
Bathroom cabinets	Fair	Yes	No	
Other surfaces				

If the overall condition of a component is similar throughout a dwelling, that condition should be recorded. If a component in a couple of locations is in poor condition, but the overall condition is good or fair, the specific sites of the badly deteriorated paint should be noted. The specific locations of any component with bite marks should be recorded.

2. Painting Frequency and Methods

   a. How often is painting completed? every ____5_____ years

   b. Is painting completed upon vacancy, if necessary?
   __X____ Yes _____ No

   c. Who does the painting? ___X____Property Owner _____Residents
   IF Residents, SKIP to Q.2

   d. Is painting accompanied by scraping, sanding, or paint removal?
   ___X___ Yes _____ No

   e. How are paint dust/chips cleaned up? (check one)
   __X____ Sweeping _____ Vacuum _____ Mopping _____ HEPA/TSP/HEPA

   f. Is the work area sealed off during painting?
   _____ Yes __X____ No

   g. Is furniture removed from the work area?
   _____ Yes ___X___ No

   h. If no, is furniture covered during work with plastic?
   _____ Yes ___X___ No

3. Is there a preventive maintenance program?
   _____ Yes ___X___ No

4. Describe work order system (if applicable, attach copy of work order form)

   There is no formal work order system.

5. How are resident complaints received and addressed? How are requests prioritized? If formal work orders are issued, is the presence or potential presence of lead-based paint considered in the work instructions?

   Resident complaints are received directly by the owner, who then authorizes the maintenance employee to complete the necessary repairs. The presence of lead-based paint is not routinely considered in the repair and maintenance work.

6. Record location of dwellings recently prepared for reoccupancy.

   Not Applicable

Form 5.1
Building Condition Form

Condition	Yes	No
Roof Missing Parts of Surfaces (tiles, boards, etc.)		X
Roof Has Holes or Large Cracks		X
Gutter or Downspouts Broken	X	
Chimney Masonry cracked, bricks loose or missing, obviously out of plumb		X
Exterior or interior walls have obvious large cracks or holes, requiring more than routine painting		X
Exterior siding has missing boards or shingles		X
Water stains on interior walls or ceilings		X
Plaster walls deteriorated		X
Two or more windows or doors broken, missing, or boarded up		X
Porch or steps have major elements broken, missing, or boarded up		X
Foundation has major cracks, missing material, structural leans, or visibly unsound		X
Total	2 (1, see notes)	

If the "Yes" column has 2 or more checks, the dwelling is considered to be in poor condition for the purposes of a risk assessment. However, specific conditions and extenuating circumstances should be considered before determining final condition of the building and the appropriateness of a lead hazard screen.

Notes:

Gutter downspout reattached during visit; owner stated this was due to a recent storm

8. Dwelling Selection Process

   This section is not applicable for this property

9. Analysis of Previous XRF Testing Report

   There is no previous XRF Testing Report; this section is not applicable for this property.

Form 5.3
Field Sampling Form for Deteriorated Paint

Name of Risk Assessor Michael Hazard
Name of Property Owner Joseph Smith
Property Address 1234 Main St, Anywhere Any State 300000 Apt. No._____
Sampling Protocol __X___All Dwellings _____Targeted _____Worst-Case _____Random
Target Dwelling Criteria (Check All That Apply)

_____ Code Violations
_____ Judged to be in Poor Condition
_____ Presence of 2 or More Children between Ages of 6 Months and 6 Years
_____ Serves as Day-Care Facility
_____ Recently Prepared for Reoccupancy
_____ Random Sampling
_____ None of the above

Sample Number	Room	Building Component	Laboratory Result (µg/g) or XRF Reading (mg/cm²)
1	Southeast Child's Bedroom (Bobby's Room)	Window Trough Frame	9.2 mg/cm² (portable XRF)
2	Front Porch	Floor	0.1 mg/cm² (portable XRF)
3	Southeast Child's Bedroom (Bobby's Room)	Interior Door	5.3 mg/cm² (portable XRF)
4	Living Room	Window Trough Frame	7.8 mg/cm² (portable XRF)
HUD Standard			5,000 µg/g or 1 mg/cm²

Sample all layers of paint, not just deteriorated paint layers
Total Number of Samples This Page___4_____
Page ____1____ of ____1_____
Date of Sample Collection_4___/_1___/_94___ Date Shipped to Lab_4___/__1__/__94__
Shipped by _____ Received by _____
(signature)(signature)
Date Results Reported _4___/_10___/_93___
Analyzed by___Lisa Baker_____
Approved by___Jim Zimmerman_____

Form 5.4
Field Sampling Form For Dust
(Single Surface)

Name of Risk Assessor _____Michael Hazard_____
Name of Property Owner _____Joseph Smith_____
Property Address _1234 Main St, Anywhere, Any State_____ Apt. No._____

Dwelling Selection Protocol __X___ All Dwellings _____ Targeted _____ Worst-Case _____ Random
Target Dwelling Criteria (Check All That Apply)
_____ Code Violations
_____ Judged to be in Poor Condition
_____ Presence of 2 or More Children between Ages of 6 Months and 6 Years
_____ Serves as Day-Care Facility
_____ Recently Prepared for Reoccupancy

Sample Number	Room (Record Name of Room Used by the Owner or Resident)	Surface Type	Is Surface Smooth and Cleanable?	Dimensions[1] of Sample Area (inches x inches)	Area (ft²)	Result of Lab Analysis (µg/ft²)
1	Play Room Living Room	Floor	Yes	_12_ x _12_	1	79
2	Play Room Living Room	Interior Window Sill	Yes	_3__ x _33_	0.69	150
3	Kitchen _____	Floor	Yes	_12_ x _12_	1	<25
4	Kitchen _____	Window Trough	No	_3__ x _25_	0.52	579
5	Bedroom 1 Bobby (Southeast)	Floor	No	_12_ x _12_	1	1,356
6	Bedroom 1 Bobby (Southeast)	Interior Window Sill	No	_2.5_ x _34_	0.59	400
7	Bedroom 2 Jennifer (Southwest)	Floor	Yes	_12_ x _12_	1	29
8	Bedroom Jennifer (Southwest)	Window Trough	No	_3_ x _33_	0.69	600
9	Blank					<25

[1] Measure to the nearest 1/8 inch

Total Number of Samples This Page____9____
Page ___1_____ of ____1_____
Date of Sample Collection__4__/__1__/_94_ Date Shipped to Lab__4__/_4___/_94___
Shipped by _____ Received by_____
(signature)(signature)
HUD Standards: 100 µg/ft² (floors), 500 µg/ft² (interior window sills), 800 µg/ft² (window troughs)

Form 5.5
Field Sampling Form For Soil
(Composite Sampling Only)

Name of Risk Assessor ____Michael Hazard_____
Name of Property Owner ___Joseph Smith_____
Property Address _1234 Main St. Anywhere, Any State_____

Sample No.	Location	Bare or Covered	Lab Result (µg/g)
1	Building Perimeter	Bare	222
	Building Perimeter		
2	Play Area 1 (describe) Back Yard Jungle Gym	Bare	102
	Play Area 2 (describe) _____		

Collect only the top ½" of soil

Total Number of Samples This Page____2____
Page ___1_____ of ____2_____
Date of Sample Collection__4__/__1__/__94__ Date Shipped to Lab__4__/__1__/__94__

Shipped by _____ Received by _____
(signature)(signature)

13. Other sampling results

The owner decided not to have water sampling conducted at this property.

Part III: Lead Hazard Control Options

14. Lead-Based Paint Policy Statement

The owner indicated such a statement would be developed.

15. Name of Individual in Charge of Lead-Based Paint Hazard Control Program: Joseph Smith

16. Recommended Changes to Work Order System and Property Management

The existing work order system is an informal verbal one. If painted surfaces will be disturbed during a particular repair job, the painted surface should be tested to determine if it has lead-based paint on it. If it does (or if testing is not completed), the maintenance worker should take the necessary precautions by wetting down the surface and performing cleanup. If the surface area is large or if the work will generate a significant amount of dust, clearance testing should be completed before residents move back into the room. The table below can be used as a general guide in determining whether maintenance jobs are likely to be high risk or low risk.

When work is assigned, the owner or worker should determine whether or not the job is low or high risk and adopt protective measures as needed

Table 17.1 (Taken from HUD Guidelines)
Summary of Low- and High-Risk Job Designations for Surfaces Known or Suspected to Have Lead-Based Paint

Job Description	Low Risk	High Risk*
Repainting (includes surface preparation)		√
Plastering or wall repair		√
Window repair		√
Water or moisture damage repair (repainting and plumbing)		√
Door repair	√	
Building component replacement		√
Welding on Painted Surfaces		√
Door lock repair or replacement	√	
Electrical fixture repair	√	
Floor refinishing		√
Carpet replacement		√
Groundskeeping	√	
Radiator leak repair	√	
Baluster repair (metal)		√
Demolition		√

* High-risk jobs typically disturb more than 2 square feet per room. If these jobs disturb less than 2 square feet, then they can be considered low-risk jobs.

Table 17.2
Summary of Protective Measures For Low- and High-Risk Jobs

Protective Measure	Low Risk	High Risk
Worksite preparation with plastic sheeting (6 mil thick)	Plastic sheet no less than 5 feet by 5 feet immediately underneath work area	Whole floor, plus simple airlock at door or tape door shut
Children kept out of work area	Yes	Yes
Resident relocation during work	No	Yes
Respirators	Probably not necessary*	Recommended
Protective clothing Note: Protective shoe coverings are not to be worn on ladders, scaffolds, etc.	Probably not necessary*	Recommended
Personal hygiene (enforced hand washing after job)	Required	Required
Showers	Probably not necessary	Recommended
Work practices	Use wet methods, except near electrical circuits	Use wet methods, except near electrical circuits
Cleaning	Wet cleaning with lead-specific detergent trisodium phosphate or other suitable detergent around the work area only (2 linear feet beyond plastic)	HEPA vacuum/wet wash/ HEPA vacuum the entire work area
Clearance	Visual examination only	Dust sampling during the preliminary phase of the maintenance program and periodically thereafter (not required for every job)

* Employers must have objective data showing that worker exposures are less than the OSHA Permissible Exposure Limit of 50μg/m³ if respirators and protective clothing will not be provided.

Paint chips are now cleaned up by sweeping. Mopping or other wet cleaning methods should be used instead.

If residents are present, the work area should be sealed off so that leaded dust does not enter the living area. Any furniture present should be moved or covered with plastic. Further details are provided in the Appendix. The possible presence of lead-based paint should be considered in all repair and maintenance work.

A lead-based paint inspection should be completed at some point in the future to determine exactly where all the lead-based paint is located so that it can be properly managed.

The Anywhere, Any State Childhood Lead Poisoning Prevention Program offers a general awareness class in lead-based paint hazards, which both the owner and the maintenance worker should attend. The program also offers the use of a HEPA vacuum and provides advice on respirators and medical surveillance and other lead-related issues (see Appendix).

The practice of examining the condition of the paint annually or upon vacancy is a good one and should be continued.

Since the paint has not yet been completely tested, it should be assumed to contain lead-based paint. The owner should tell residents to report any paint that is peeling, chipping, flaking, chalking, or otherwise deteriorating so that it can be repaired quickly and safely.

17. Interim Control Options and Estimated Costs

The costs shown below include labor, materials, worker protection, site containment and cleanup. These are only very rough estimates that may not be accurate; a precise estimate should be obtained from a certified lead-based paint abatement contractor. I would be pleased to perform clearance testing after this work has been completed at your request.

Hazard A: Window Trough Surfaces

a. Paint Film Stabilization of both frame and sash $xx/window
b. Encapsulation of Exterior Frame with a Liquid Encapsulant Coating plus sash replacement $xx/window

Hazard B: Leaded Dust On Bobby Jones' Bedroom (Southeast Bedroom) Floor

a. Dust removal and recoating hardwood floor with polyurethane $xxx

Hazard C: Deteriorated Lead-Based Paint on the interior door leading to Bobby's Bedroom (Southeast Bedroom)

a. Paint Film Stabilization plus rehang door for smooth operation (paint film stabilization alone without door repair is not appropriate) $xx

18. Acceptable Abatement Options and Estimated Costs

Hazard A Window Trough Surfaces

a. Enclosure of window frame with metal panning system plus sash replacement $xx/window
b. Replacement of entire window assembly $xx/window
c. Remove all lead-based paint from entire window assembly using chemical paint removers $xx/window

Hazard B: Leaded Dust On Bobby's Bedroom (Southeast Bedroom) Floor

a. Enclosure of floor with new subflooring and tile $xxx/room

Hazard C: Deteriorated Lead-Based Paint on the interior door leading to Bobby's Bedroom (Southeast Bedroom)

a. Replace door and door frame $xxx

b.	Encapsulate door	$xxx
c.	Replace door and enclose door frame	$xxx
d.	Remove lead-based paint from door and door frame chemically	$xxx

19. Reevaluation and Monitoring Schedule

Each of these treatments will need to be reexamined periodically to make certain that they remain effective and to ensure that new lead-based paint hazards do not appear. The interim controls shown above are less expensive initially, but they may be more expensive in the long run since they need to be reevaluated more frequently. The replacement and paint removal methods are more expensive initially, but do not require any reevaluation.

The owner should monitor the condition of the paint at least annual annually or if there is some indication that paint might be failing. A professional reevaluation is also needed. The standard schedule for reevaluating the dwelling is shown below.

Reevaluation: Standard Reevaluation Schedule 3 contained in the HUD Guidelines applies to this property, since one of the rooms had a dust lead level greater than the standard. Therefore, the dwelling should be reevaluated in April 1995 (12 months from now). If no lead-based paint hazards are identified at that time, another reevaluation should be conducted in April 1997 (2 years later). If no lead-based paint hazards are identified at that time, no further reevaluations are needed. However, since lead-based paint may be present in the dwelling, the owner should monitor the condition of all painted surfaces at least annually or whenever other information indicates a potential problem.

Part IV: Site-Specific Lead Hazard Control Plan

20. Lead Hazard Control Option To Be Implemented in This Property

Hazard A: Window Trough Surfaces

Paint Film Stabilization of both frame and sash

Hazard B: Leaded Dust On Bobby Smith's Bedroom (Southeast Bedroom) Floor

Dust removal and recoating hardwood floor with polyurethane

Hazard C: Deteriorated Lead-Based Paint on the interior door leading to Bobby's Bedroom (Southeast Bedroom)

Replace door and door frame

21. Training Plan for Managers, Maintenance Supervisors and Workers

The part-time worker will attend the lead awareness class offered by the Anywhere Any State Childhood Lead Poisoning Prevention Program to learn how maintenance work can be conducted safely when dealing with lead-based paint. The owner has agreed to attend the same class. The Appendix to this report contains brochures with the relevant information.

22. Method of Resident Notification of Results of Risk Assessment and Lead Hazard Control Program

The summary of this report will be provided by the owner to the residents in the dwelling. The brochure in the Appendix will be provided to the residents. The owner will explain to the resident that the lead hazards at the property will be corrected within two weeks. The dwelling will be tested after the work has been completed to make certain that it was effective. After the work has been completed and clearance established, a certificate will be appended to this report.

23. Signatures (Risk Assessor and Owner), Date and Certificate of Lead-Based Paint Compliance

_____

Joseph Smith, Owner
(date)

_____

Michael Hazard, Certified Risk Assessor
(date)

Example of Certificate of Lead-Based Paint Compliance

I hereby certify that on May 1, 1994 the dwelling located at 1234 Main St, Anywhere, Any State meets the criteria established by the Department of Housing and Urban Development for lead safety. Either no lead-based paint hazards were identified or all lead-based paint hazards have been corrected.

_____

Owner

_____

Authorized Signature

Risk Assessor License # _____

Expiration Date: March 31, 1996

Any State
Department of Health
Division of Childhood Lead Poisoning Prevention

Appendix 8.2

Example of a Risk Assessment Report for a Large Multi-Family Housing Development

Part I: Identifying Information:

Lead-Based Paint Risk Assessment Report

For Home Sweet Home Apartment Building

5678 Main St.
Anywhere, Any State 300000

Prepared For:

Mr. Joseph H. Smith, Owner
4444 Podunck Way
Anywhere, Any State 300000
400-777-7777

By:

Michael L. Hazard, Certified Assessor
5678 Snowflake St.
Anywhere, Any State 300000
400-333-3333

Any State License No. 94-567
EPA Certificate No. 33456

April 19, 1994

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Summary

Part I: Identifying Information

A lead-based paint risk assessment was conducted at the Home Sweet Home Apartment Building at 5678 Main St. in Anywhere, Any State 300000 for Mr. Joseph H. Smith, Owner, who is located at 4444 Podunck Way, Anywhere, Any State 300000 (400-777-7777) on April 1, 1994. The risk assessment was conducted by Michael L. Hazard, a Certified Risk Assessor (Any State License No. 94-567).

Home Sweet Home contains 438 apartments distributed through 15 stories. All the apartments are of a similar construction and have been repainted over the years in a similar fashion (the apartment owner's maintenance crew does most of the painting). Twenty-three of the units were targeted for sampling and visual assessment for this risk assessment using the criteria established in the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing. One of these 23 targeted dwellings had been recently prepared for reoccupancy.

Part II. Results

4. List of Location and Type of Identified Lead-Based Paint Hazards

The building and its paint are in relatively poor condition overall, with water leaks and structural deficiencies evident throughout. The risk assessment showed that lead hazards exist in the following locations:

Hazard A: Deteriorated lead-based paint on the exterior doors, window troughs, exterior trim and on the interior kitchen and bathroom walls.

Hazard B: Leaded dust on window troughs and in common hallways.

Hazard C: Contaminated soil in the play area located at the front of the building and around the building perimeter.

Paint chip sampling indicated that lead-based paint is present on exterior doors, window troughs, exterior trim, and on interior kitchen and bathroom walls. Previous lead-based paint testing at this location indicated that lead-based paint was present on <u>all</u> interior walls and kitchen cabinets, but in no other location. A review of the testing report showed that many painted surfaces had not been tested at all. For those that were tested, no attempt had been made to correct for the substrate underneath the paint. For example, the previous report indicated that lead-based paint was present on the kitchen cabinets. However, laboratory analysis of this paint indicated that the cabinets do <u>not</u> in fact contain lead-based paint and therefore do not require treatment. A more complete lead-based paint testing effort is needed if the exact locations of lead-based paint is to be determined. The previous testing report should not be relied upon to determine how maintenance and other repair work should be done.

Dust testing showed that leaded dust on window troughs in all rooms sampled averaged 30,532 µg/ft², more than 10 times greater than the HUD standard of 800 µg/ft².

Soil lead levels around the perimeter of the building and in the playground in front of the building were between 3,000 - 4,000 µg/g, well above the HUD Interim Standard of 2,000 µg/g for building perimeters and 400 µg/g for play areas.

After considering a number of options, the owner has decided to use interim controls in the immediate future, since the building is scheduled for comprehensive renovation within several years. These interim controls include:

- Stabilizing the paint on all surfaces that have deteriorated lead-based paint
- Removal of leaded dust located on window troughs and in common hallways
- Covering the bare soil with new sod and planting thorny bushes around the building perimeter to prevent children from entering this area. The play area will be covered with a suitable ground liner and then covered with sand at least 12 inches deep.

Mr. Smith has chosen to use interim controls until the building is renovated, which is scheduled to occur in 1998. A lead-based paint inspection will be performed at that time with the intent of including abatement in the renovation plans. The ten maintenance workers (some of whom work in other nearby apartment buildings owned by Mr. Smith), will all be trained in lead-based paint work practices. Certain property management practices will also be adopted to ensure that the normal repair work done will not disturb those surfaces with lead-based paint.

After the interim control work has been completed, a clearance examination, including dust sampling must be completed to make certain that the dwelling is lead-safe before the family moves back into the affected rooms.

Reevaluation:

Because the levels of leaded dust were more than 10 times greater than the HUD standard, this property should be reevaluated according to Schedule 4 in the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.* This schedule calls for a reevaluation in September 1994 (6 months from now). If no lead-based paint hazards are identified, another reevaluation is not needed until September 1995 (1 year later). Assuming no new lead-based paint hazards are identified, a final reevaluation should be performed in September 1997, according to the HUD Guidelines. If the building passes the reevaluation, no further reevaluation is required, although the owner should still monitor the condition of the paint at least annually or whenever there is information that the paint is deteriorating.

After explaining the control measures that will be undertaken, Mr. Smith has agreed to share the results of this report with the residents in the building, and to provide each family with the EPA brochure and a brochure from the Anywhere Childhood Lead Poisoning Prevention program as a way of educating the residents.

Form 5.6
Management Data For Rental Dwellings

Part 1: Identifying Information

Identifying Information:

Name of Building or Development Home Sweet Home Apartment Building
Number of Buildings ____1_____
Number of Individual Dwelling Units/Building: ____438___
Number of Total Dwelling Units: ___438____
Date of Construction 1937
Date of Substantial Rehab, if any None

List of Addresses of Dwellings (attach list if more than 10 dwellings are present)

Dwelling Unit No.	Address	No. Children Aged 0 - 6 Years Old	Recent Code Violation Reported by Owner?	Chronic Maintenance Problem?
1	5678 Main St. Anywhere,Any State	209	No	No
2		2	No	No
3		1	No	No
4		3	No	No
5		0	No	No
6		0	No	No
7		0	No	No
8		2	No	No
9		3	Yes	Yes
10		0	No	

(**Other pages of this form would be included to list all 438 units)**
Record number and locations of common child play areas (on-site playground, backyards, etc.)

Number 1 On-Site Playground in Front of Building

Part 2: Management Information

1. List names of individuals who have responsibility for lead-based paint. Include owner, property manager (if applicable), maintenance supervisor and staff (if applicable) and others. Include any training in lead hazard control work (inspector, supervisor, worker, etc.) that has been completed. Use additional pages, if necessary.

   This information will be needed to devise the risk management plan contained in the risk assessor's report.

Name	Position	Training Completed (if none, enter "None")
Joseph Smith	Owner	None
Madeline Fairfield	Property Manager	None
Joe Sweat	Maintenance Supervisor	None

2. Has there been previous lead-based paint evaluations?
   __X__ Yes _____ No (If yes, attach the report)

3. Has there been previous lead hazard control activity?
   _____ Yes ___X___ No (If yes, attach the report)

4. Maintenance usually conducted at time of dwelling turnover:

Repainting_____X_____
Cleaning_____X_____
Repair ____As Needed___

Comments:
The dwelling has all trash removed after the resident has left. Joe Sweat inspects the dwelling and decides whether repainting is needed or other repairs to building systems are necessary. After performing any repainting or other repairs, the floors are mopped and the kitchen counters and bathrooms cleaned. All other floors are vacuumed.

5. Employee and Worker Safety Plan

   a. Is there an occupational safety and health plan for maintenance workers?
      _____ Yes ___X___ No (If yes, attach plan)

   b. Are workers trained in lead hazard recognition?
      _____ Yes ___X___ No If yes, who performed the training?
      _____

c. Are workers involved in a hazard communication program?
_____ Yes ___X___ No

d. Are workers trained in proper use of respirators?
_____ Yes ___X___ No

e. Is there a medical surveillance program
_____ Yes ___X___ No

6. Is there a HEPA Vacuum available?
_____ Yes ___X___ No

7. Are there any on-site licensed or unlicensed day-care facilities.
_____ Yes ___X___ No If yes, give location _____

8. Planning for Resident Children with Elevated Blood Levels

a. Who responds for the owner if a resident children with elevated blood lead levels is identified?
Madeline Fairfield

b. Is there a plan to relocate such children?
_____ Yes ___X___ No If Yes, Where? _____

c. Do you (the owner) know if there ever has been a resident child with an elevated blood lead level?
_____ Yes _____ No ___X___Unknown

9. Owner Inspections

a. Are there periodic inspections of all dwellings by the owner?
___X___ Yes _____ No If Yes, how often? Every year or whenever the unit is vacant

b. Is the paint condition assessed during these inspections?
___X___ Yes _____ No

10. Do you (the owner) know if any of the dwellings have ever received a housing code violation notice?
_____ Yes __X____ No _____ Unknown If yes, describe code violation
_____
_____

11. If previously detected, unabated lead-based paint exists in the dwelling, have the residents been informed? _____ Yes ___X___ No

Form 5.7
Maintenance Data for Rental Dwellings

Condition of Paint on Selected Surfaces (Separate Page For Each Targeted Dwelling)

Building Component	Paint Condition (Intact, Fair, Poor, or Not Present) To Be Completed by Risk Assessor	Deterioration Due to Friction or Impact?	Deterioration Due to Moisture?	Location of Painted Component with Visible Bite Marks
Building Siding	Fair			
Exterior Trim	Poor	No	No	
Window Troughs	Poor	No	No	
Exterior Doors	Poor	Yes	No	
Railings	Fair	Yes	No	
Porch Floors	Not Applicable			
Other Porch Surfaces	Not Applicable			
Interior Doors	Fair	Yes	No	
Ceilings	Fair		No	
Walls	Intact (Kitchen and Bathroom Walls are Poor)			
Interior Windows	Fair	Yes	No	
Interior Floors	Fair	Yes	No	
Interior Trim	Intact			
Stairways	Fair	Yes	No	
Radiator (Or Radiator Cover)	Intact			
Kitchen cabinets	Poor	No	No	
Bathroom cabinets	Intact			
Other surfaces				

If the overall condition of a component is similar throughout a dwelling, that condition should be recorded. If a component in a couple of locations is in poor condition, but the overall condition is good or fair, the specific sites of the badly deteriorated paint should be noted. The specific locations of any component with bite marks should be recorded.

Form 5.7 (continued)

1. Painting Frequency and Methods

   a. How often is painting completed? every ____5_____ years

   b. Is painting completed upon vacancy, if necessary?
   __X____ Yes _____ No

   c. Who does the painting? ___X____Property Owner _____Residents
   IF Residents, SKIP to Q.2

   d. Is painting accompanied by scraping, sanding, or paint removal?
   ___X___ Yes _____ No

   e. How are paint dust/chips cleaned up? (check one)
   __X____ Sweeping _____ Vacuum _____ Mopping _____ HEPA/TSP/HEPA

   f. Is the work area sealed off during painting?
   _____ Yes __X____ No

   g. Is furniture removed from the work area?
   _____ Yes ___X___ No

   h. If no, is furniture covered during work with plastic?
   _____ Yes ___X___ No

2. Is there a preventive maintenance program?
   _____ Yes ___X___ No

3. Describe work order system (if applicable, attach copy of work order form)

   Ms. Madeline Fairfield, property manager, receives complaints from residents and prepares a written work order for Mr. Joe Sweat, maintenance supervisor, who assigns the job to one or more individual workers

4. How are resident complaints received and addressed? How are requests prioritized? If formal work orders are issued, is the presence or potential presence of lead-based paint considered in the work instructions?

   Resident complaints are received directly by the property manager, who then authorizes the maintenance supervisor to complete the necessary repairs. The presence of lead-based paint is not routinely considered in the repair and maintenance work.

5. Record location of dwellings recently prepared for reoccupancy.

   Apartment 234

Form 5.1
Building Condition Form

Condition	Yes	No
Roof Missing Parts of Surfaces (tiles, boards, etc.)		X
Roof Has Holes or Large Cracks	X	X
Gutter or Downspouts Broken	X	
Chimney Masonry cracked, bricks loose or missing, obviously out of plumb		X
Exterior or interior walls have obvious large cracks or holes, requiring more than routine painting		X
Exterior siding has missing boards or shingles	X	X
Water stains on interior walls or ceilings	X	X
Plaster walls deteriorated		X
Two or more windows or doors broken, missing, or boarded up	X	X
Porch or steps have major elements broken, missing, or boarded up		X
Foundation has major cracks, missing material, structural leans, or visibly unsound		X
Total	6	

If the "Yes" column has 4 or more checks, the dwelling is considered to be in poor condition. Less than 4 checks in the "Yes" column means that the dwelling appears to be well maintained.

8. Dwelling Selection Process

HUD Guidelines state that for buildings with 438 apartments with a similar painting history and management history, 23 of those apartments can be selected to characterize the lead-based paint risks throughout the building. These 23 apartments were selected using a targeted approach, as defined in the HUD Guidelines. Information on maintenance history, code violations, and presence of young children was used to select those apartments likely to have the highest risks. The dwellings were not selected randomly. Walkthrough surveys could not be conducted in all 438 apartments.

9. Analysis of Previous XRF Testing

A preliminary assessment of an XRF Lead-Based Paint inspection conducted 5 years ago by Joe Crook Inspections was performed using the criteria in the HUD Guidelines. The results of this assessment indicate that the earlier results are unreliable and that further testing will be needed before any substantial renovation or disturbance of surfaces with lead-based paint.

	Review of Previous Lead-Based Paint Inspections	**YES**	**NO**
1	Did the report clearly explain the entire testing program and include an executive summary in narrative form?		X
2	Did the report provide an itemized list of similar building components (testing combinations) and the percentage of each component that tested positive, negative, and inconclusive? (Percentages are not applicable for single family dwellings.)		X
3	Did the report include test results for the common areas and building exteriors as well as the interior of the dwelling units?	X	
4	Were all of the painted surfaces that are known to exist in the dwelling units, common areas, and building exteriors included in the itemized list of components that were tested?		X
5	Does the owner fully comprehend the report and completely understand their responsibilities regarding further testing or hazard control?		X
6	If confirmation testing (laboratory testing) was necessary, did the testing firm amend the final report and revise the list of surfaces that tested positive, negative, and inconclusive?		X
7	Was the unit selection process performed randomly?	X	
8	Is the name of the XRF Manufacturer, Model Number, and Serial Number of the XRF that was used in each unit recorded in the report?		X
9	Did the report record the XRF calibration checks for each day that testing was performed?	X	
10	Did the calibration checks indicate that the instrument was operating within the Quality Control Value (see chapter 7)?		X
11	Were three readings collected for each surface?	X	
12	Were substrate corrections performed (if necessary)?	X	
13	Were confirmatory paint chip samples collected if XRF readings were in the inconclusive range?		
14	Was the procedure that was used to collect the paint chip samples described?		X
15	Was the laboratory that analyzed the paint samples identified?		X

Form 5.3
Field Sampling Form for Deteriorated Paint
(Use a Separate Page for Every Unit in Multi-Family Housing)

Name of Risk Assessor Michael Hazard
Name of Property Owner Joseph Smith
Property Address 5678 Main St, Anywhere Any State 300000 Apt. No.___9_____

Sampling Protocol _____All Dwellings __X___Targeted _____Worst-Case _____Random
Target Dwelling Criteria (Check All That Apply)
__X___ Code Violations
__X___ Judged to be in Poor Condition
__X___ Presence of 2 or More Children between Ages of 6 Months and 6 Years
_____ Serves as Day-Care Facility
_____ Recently Prepared for Reoccupancy
_____ Random Sampling

Sample Number	Room	Building Component	Lead (μg/g or mg/cm²)
1	Southeast Child's Bedroom (Bobby's Room)	Window Trough Frame	12,638 μg/g
2	Kitchen	Cabinets	238 μg/g
3	Kitchen	Walls	7,893 μg/g
4	Bathroom	Walls	10,487 μg/g
HUD Standard			5,000 μg/g or 1 mg/cm²

Sample all layers of paint, not just deteriorated paint layers
Total Number of Samples This Page___4_____
Page ____1____ of ____1_____
Date of Sample Collection_4___/_1___/_94___ Date Shipped to Lab_4___/__1__/__94__
Shipped by _____ Received by _____
(signature) (signature)
Date Results Reported _4___/_10___/_94___ Analyzed by___Lisa Baker_____
Approved by___Jim Zimmerman_____

Form 5.4a
Field Sampling Form for Dust
(Composite Sampling) (A separate page is used for each unit or common area)

Name of Risk Assessor ___Michael Hazard_____
Name of Property Owner ___Joseph Smith_____
Property Address _5678 Main St_____ Apt. No.____9_____

Dwelling Selection Protocol _____ All Dwellings __X___ Targeted _____ Worst-Case _____ Random

Target Dwelling Criteria (Check All That Apply)
__X___ Code Violations
__X___ Judged to be in Poor Condition
__X___ Presence of 2 or More Children between Ages of 6 Months and 6 Years
_____ Serves as Day-Care Facility
_____ Recently Prepared for Reoccupancy
_____ Random Sampling

Sample Number	Record Name of Rooms Used by Owner or Resident to be Included in Sample	Dimension[1] of Surface Sampled in Each Room (inches x inches)	Total Surface Area Sampled (ft^2)	Type of Surface Sampled	Is Surface Smooth and Cleanable?	Lab Result ($\mu g/ft^2$)
1	_Kitchen___ _Living Room_ _Child's Bedroom__ _2nd Bedroom__	_12_ x _12_ _12_ x _12_ _12_ x _12_ _12_ x _12_	4	Smooth Floors	Yes	124
	_____ _____ _____ _____	____ x ____ ____ x ____ ____ x ____ ____ x ____		Carpeted Floors		
2	_Kitchen Living Room _Child's Bedroom _2nd Bedroom	_3__ x _33.5_ _3.25_ x _33.5_ _3.25_ x _33.5_ _3.25_ x _33.5_	2.97	Interior Window Sills	Yes	336
3	_Kitchen__ _Living Room_ _Child's Bedroom_ _2nd Bedroom_	_2.4_x _33.5_ _2.5_ x _33.5_ _2.5_ x _33.5_ _2.5_ x _33.5_	2.30	Window Troughs	No	30,456

[1] Measure to the nearest 1/8 inch
Total Number of Samples This Page___3_____
Page ____1_____ of ___27_____
Date of Sample Collection__4__/__1__/__94__ Date Shipped to Lab_4___/_1___/_94___
Shipped by _____ Received by _____
(signature) (signature)
HUD Standards: 100 $\mu g/ft^2$ (floors), 500 $\mu g/ft^2$ (interior window sills), 800 $\mu g/ft^2$ window troughs

Form 5.4a
Field Sampling Form for Dust
(Composite Sampling)

Name of Risk Assessor ___Michael Hazard_____
Name of Property Owner ___Joseph Smith_____
Property Address _5678 Main St_____ Apt. No._COMMON AREAS__

Dwelling Selection Protocol _____ All Dwellings __X___ Targeted _____ Worst-Case _____ Random
Target Dwelling Criteria (Check All That Apply)
_____ Code Violations
_____ Judged to be in Poor Condition
_____ Presence of 2 or More Children between Ages of 6 Months and 6 Years
_____ Serves as Day-Care Facility
_____ Recently Prepared for Reoccupancy

Sample Number	Record Name of Rooms Used by Owner or Resident to be Included in Sample	Dimension[1] of Surface Sampled in Each Room (inches x inches)	Total Surface Area Sampled (ft^2)	Type of Surface Sampled	Is Surface Smooth and Cleanable?	Lab Result ($\mu g/ft^2$)
C-1	1st Floor Hallway_ 5th Floor Hallway_ 9th Floor Hallway_ 13th Floor Hallway	_12_ x _12_ _12_ x _12_ _12_ x _12_ _12_ x _12_	4	Smooth Floors	Yes	124
C-2	_1st Floor Hallway_ _5th Floor Hallway_ _9th Floor Hallway_ 13th Floor Hallway	_3__ x _33.5_ _3.25_ x _33.5_ _3.25_ x _33.5_ _3.25_ x _33.5_	2.97	Window Troughs	No	47,894
C-3	_1st Floor 5th Floor 9th Floor 13th Floor	8 x 12 8x12 8x12 8x12	2.67	Stair Treads	No	336
C-4	_1st Floor_ _5th Floor_ _9th Floor_ _13th Floor_	_12_x _12_ _12_ x _12_ _12_ x _12_ _12_ x _12_	4	Landings	No	16,456

[1] Measure to the nearest 1/8 inch
Total Number of Samples This Page___4_____
Page ____2_____ of ___27_____
Date of Sample Collection__4__/__1__/__94__ Date Shipped to Lab_4___/_1___/_94___
Shipped by _____ Received by _____
(signature) (signature)
HUD Standards: 100 $\mu g/ft^2$ (floors), 500 $\mu g/ft^2$ (interior window sills), 800 $\mu g/ft^2$ window troughs

Form 5.5
Field Sampling Form For Soil
(Composite Sampling Only)

Name of Risk Assessor ____Michael Hazard_____
Name of Property Owner ___Joseph Smith_____
Property Address _5678 Main St. Anywhere, Any State_____

Sample No.	Location	Bare or Covered	Lab Result (µg/g)
S-1	Building Perimeter (North & East Sides)	Bare	3,989
S-2	Building Perimeter (South & West Sides)	Bare	3,498
S-3	Play Area Front Playground	Bare	3,897
	Play Area 2 (describe) _____		
HUD Interim Standard			400 for bare play areas, 2000 for other yard ares

Collect only the top ½" of soil

Total Number of Samples This Page____3____
Page ___3_____ of ____27_____
Date of Sample Collection__4__/__1__/__94__ Date Shipped to Lab__4__/__1__/__94__

Shipped by _____ Received by _____
(signature) (signature)

Part III: Lead Hazard Control Options

14. Lead-Based Paint Policy Statement

Home Sweet Home has decided to adopt a lead-based paint policy statement, as follows:

_____

Home Sweet Home Property Management Company is committed to controlling lead-based paint hazards in all its apartments. Madeline Fairfield, Property Manager, has my authority to direct all activities associated with lead hazard control, including directing training, issuing special work orders, informing residents, responding to cases of children with elevated blood lead levels, correcting lead-based paint hazards on an emergency repair basis, and any other efforts that may be appropriate. The company's plan to control such hazards is detailed in a risk assessment report and lead hazard control plan.

(Signed)_Joseph Smith_____ _____(Date)

(Owner)

(Signed)__Madeline Fairfield_____ _____(Date)

(Lead Hazard Control Program Manager)

_____

15. Name of Individual in Charge of Lead-Based Paint Hazard Control Program Madeline Fairfield

16. Recommended Changes to Work Order System and Property Management

If painted surfaces will be disturbed during a particular repair job, the painted surface should be tested to determine if it has lead-based paint on it, unless it has been tested previously by reliable testing. The results in this report indicate that lead-based paint is definitely present on exterior doors, window trough frames, exterior trim, and kitchen and bathroom walls. All other surfaces should be considered to be suspected lead-based paint until they have been tested. If lead-based paint is present (or is suspected to be present), the maintenance worker should take the necessary precautions by wetting down the surface and performing cleanup. If the surface area is large, clearance testing should be completed before residents move back in. As general guidance, the table shown below can be used. The work order should indicate whether respirators and protective clothing are needed, how extensive the cleaning should be, and any other special precautions. The Appendix to this report contains a sample of a work order form for lead-based paint work.

Paint chips are now cleaned up by sweeping. Mopping or other wet cleaning methods should be used instead.

If residents are present, the work area should be sealed off so that leaded dust does not enter the living area. Any furniture present should be moved or covered with plastic. Further details are provided in the Appendix. The possible presence of lead-based paint should be considered in all repair and maintenance work.

A lead-based paint inspection should be completed at some point in the future to determine exactly where all the lead-based paint is located so that it can be properly managed.

Table 17.1 (from HUD Guidelines)
Summary of Low- and High-Risk Job Designations for Surfaces Known or Suspected to Have Lead-Based Paint

Job Description	Low Risk	High Risk*
Repainting (includes surface preparation)		√
Plastering or wall repair		√
Window repair		√
Water or moisture damage repair (repainting and plumbing)		√
Door repair	√	
Building component replacement		√
Welding on Painted Surfaces		√
Door lock repair or replacement	√	
Electrical fixture repair	√	
Floor refinishing		√
Carpet replacement		√
Groundskeeping	√	
Radiator leak repair	√	
Baluster repair (metal)		√
Demolition		√

* High-risk jobs typically disturb more than 2 square feet per room. If these jobs disturb less than 2 square feet, then they can be considered low-risk jobs.

Table 17.2 (from HUD Guidelines)
Summary of Protective Measures For Low- and High-Risk Jobs

Protective Measure	Low Risk	High Risk
Worksite preparation with plastic sheeting (6 mil thick)	Plastic sheet no less than 5 feet by 5 feet immediately underneath work area	Whole floor, plus simple airlock at door or tape door shut
Children kept out of work area	Yes	Yes
Resident relocation during work	No	Yes
Respirators	Probably not necessary*	Recommended
Protective clothing Note: Protective shoe coverings are not to be worn on ladders, scaffolds, etc.	Probably not necessary*	Recommended
Personal hygiene (enforced hand washing after job)	Required	Required
Showers	Probably not necessary	Recommended
Work practices	Use wet methods, except near electrical circuits	Use wet methods, except near electrical circuits
Cleaning	Wet cleaning with lead-specific detergent trisodium phosphate or other suitable detergent around the work area only (2 linear feet beyond plastic)	HEPA vacuum/wet wash/ HEPA vacuum the entire work area
Clearance	Visual examination only	Dust sampling during the preliminary phase of the maintenance program and periodically thereafter (not required for every job)

* Employers must have objective data showing that worker exposures are less than the OSHA Permissible Exposure Limit of 50μg/m³ if respirators and protective clothing will not be provided.

The Appendix to this report contains a list of training providers who can train the maintenance workers to handle lead-based painted surfaces safely.

A HEPA vacuum should be purchased for routine use.

The Appendix also contains information on medical surveillance, respirator use, and other important considerations.

The practice of examining the condition of the paint annually or upon vacancy is a good one and should be continued.

Since the paint has not yet been fully and adequately tested, it should be assumed to contain lead-based paint. The owner should tell residents to report any paint that is peeling, chipping, flaking, chalking, or otherwise deteriorating so that it can be repaired quickly and safely.

17. Acceptable Interim Control Options and Estimated Costs

The costs shown below include labor, materials, worker protection, site containment and cleanup. These are only very rough estimates that may not be accurate; a precise estimate and a full lead hazard control plan should be obtained from a certified lead-based paint abatement contractor. I would be pleased to help you develop such a plan if you request.

Hazard A: Deteriorated Lead-Based Paint on Exterior Doors, Exterior Side of Windows, Exterior Trim, Kitchen Walls and Bathroom Walls

a. Repair of Water Leaks, followed by Paint Film Stabilization $xx
b. Repair of Water Leaks, followed by Encapsulation of Exterior Door and Window Frames with a Liquid Encapsulant Coating plus sash replacement $xx

Hazard B: Leaded Dust On Window Troughs and Common Hallways

a. Dust removal followed by sealing concrete stairway floors with concrete sealant and paint film paint film stabilization of window troughs.

Hazard C: Contaminated Soil in the Playground and Around the Building Perimeter

a. Fence off playground and building perimeter to eliminate access $xx
b. Cover soil with a suitable material such as bark, gravel, sand, astroturf and plant dense thorny bushes around building perimeter to limit access

18. Abatement Options and Estimated Costs

Hazard A: Deteriorated Lead-Based Paint on Exterior Doors, Exterior Side of Windows, Exterior Trim, Kitchen Walls and Bathroom Walls (all options assume repair of water leaks occurs first)

a. Replace doors $xx
b. Chemically remove paint from doors and repaint $xx
c. Replace windows and exterior trim $xx
d. Chemically remove paint from windows and trim and repaint $xx
e. Remove paint from trim using heat guns operating below 1100°F $xx
f. Enclosure of kitchen and bathroom walls $xx
g. Demolish and replace kitchen and bathroom walls $xx

Hazard B: Leaded Dust On Window Troughs and Common Hallways

a. Cover exterior sills with aluminum coil stock $xx
b. Replace exterior sills $xx
c. Install new tiles in common hallways $xx

Hazard C: Contaminated Soil in the Playground and Around the Building Perimeter

a. Remove and replace top soil around building and in playground $xx
b. Pave soil around building perimeter with asphalt or cement plus eliminate playground $xx
c. Pave soil around building perimeter and cover play area with a geotextile fabric and cover with new sand, soil, bark or other material providing adequate fall protection. Do not pave playground area. $xx

19. Reevaluation Schedule

Because the levels of leaded dust in window troughs were more than 10 times greater than the HUD standard, this property should be reevaluated according to Schedule 4 in the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.* This schedule calls for a reevaluation in September 1994 (6 months from now). If no lead-based paint hazards are identified, another reevaluation is not needed until September 1995 (1 year later). Assuming no new lead-based paint hazards are identified, a final reevaluation should be performed in September 1997, according to the HUD Guidelines. If the building passes the reevaluation, no further reevaluation is required, although the owner should still monitor the condition of the paint at least annually or whenever there is information that the paint is deteriorating.

Part IV: Site-Specific Lead Hazard Control Plan

20. Lead Hazard Control Option To Be Implemented in This Property

Hazard A: Deteriorated Lead-Based Paint on Exterior Doors, Exterior Side of Windows, Exterior Trim, Kitchen Walls and Bathroom Walls

Repair of Water Leaks, followed by Paint Film Stabilization $xx

Hazard B: Leaded Dust On Window Troughs and Common Hallways

Dust removal followed by sealing concrete stairway floors with concrete sealant and paint film paint film stabilization of window troughs.

Hazard C: Contaminated Soil in the Playground and Around the Building Perimeter

Soil in the playground will be covered by a liner and sand at least 12 inches deep. Dense thorny bushes will be planted around building perimeter to limit access.

21. Training Plan for Managers, Maintenance Supervisors and Workers

Ms. Madeline Fairfield will attend the lead hazard awareness training course offered by the Anywhere Childhood Lead Poisoning Prevention Program. She will be responsible for ensuring that all maintenance workers and their supervisors are trained in lead-based paint work practices.

22. Method of Resident Notification of Results of Risk Assessment and Lead Hazard Control Program

The results of this report will be described by the owner to the residents in the dwelling through a brief summary that will be placed in each resident's mailbox. The brochure in the Appendix will be provided to the residents. The owner will explain to the resident that the lead hazards at the property will be corrected within two weeks and that all residents should report any deteriorating paint in the future to Ms. Fairfield. The dwelling will be tested after the work has been completed to make certain that it was effective.

23. Signatures (Risk Assessor and Owner), Date and Certificate of Lead-Based Paint Compliance

After the work has been completed and clearance established, a certificate will be appended to this report.

_____ _____
Joseph Smith, Owner (date)

_____ _____
Michael Hazard, Certified Risk Assessor (date)

Example of Certificate of Lead-Based Paint Compliance

I hereby certify that on May 1, 1994 the apartment building located at 5678 Main St, Anywhere, Any State meets the criteria established by the Department of Housing and Urban Development for lead safety. Either no lead-based paint hazards were identified or all lead-based paint hazards have been corrected.

_____

Owner

_____

Authorized Signature

Expiration Date: September 1, 1994

Any State
Department of Health
Division of Childhood Lead Poisoning Prevention

Appendix 9: Insurance Companies Offering Lead Abatement General and Professional Liability Coverage

Fidelity Environmental Insurance Co.
105 Campus Drive - University Square
P.O. Box 7006
Princeton, NJ 08543-7006
(800) 338-1236
GL, E&O

American Safety Risk Retention Group
c/o Environmental Mgmt Ins Services
1900 The Exchange, Suite 450
Atlanta, GA 30339
(404) 916-1908
GL, E&O

North American Specialty Insurance Co.
c/o Eric Underwriters Agency
7257 South Tucson Way
Englewood, CO 80112
(800) 388-9221
GL

United Capitol Insurance Co.
1400 Lake Hearn Drive
Atlanta, GA 30319
(404) 843-5599
GL, E&O

United Coastal Insurance Co.
233 Main Street
P.O. Box 2350
New Britain, CT 06050-2350
(203) 223-5000
GL, E&O

Commercial Casualty Insurance Co.
160 Technology Park
Norcross, GA 30092
(404) 729-8209
E&O

Homestead Insurance Company
c/o Freberg Environmental Insurance
1675 Broadway, Suite 2210
Denver, CO 80202
(303) 571-4235
E&O

Commerce & Industry Insurance Co.
70 Pine Street, 11th Floor
New York, NY 10270
(212) 770-7000
GL, E&O

Reliance National Insurance Co.
77 Water Street
New York, NY 10005
(212) 858-3641
GL, E&O

Housing Authority Risk Retention Group
(Public Housing Only)
677 South Main Street
P.O. Box 189
Cheshire, CT 06410
1-800-HES-3313
1-800-873-0242

Appendix 10: Questions and Answers on Sampling Lead-Based Paint Hazardous Waste

1. What is considered a representative sample?

   A representative sample consists of a collection of the various components of the waste in the same weight proportion as is found in the entire bulk of the waste. As such, a representative sample should contain a sample of all major items found in the entire waste stream, in an accurate weight proportion. If dealing with a large quantity of waste, a minimum of four samples should be taken at any one site. A single sample may be appropriate if there is a small quantity of waste. More samples may be necessary if the variability among samples is high. A site may be defined as a pile of debris generated in a given day or waste from a given work area.

2. How should representative sampling be conducted on abatement waste (*e.g.*, large woodwork pieces, windows)?

   Waste from abatement projects can be characterized during a pre-abatement screening step or upon generation. Pre-abatement screening facilitates hazardous waste reduction via segregation of waste such as architectural components into hazardous and nonhazardous components. As a pre-abatement step for vacant residential units, an experienced contractor may be able to identify which of the architectural components should be tested through an assessment of paint quality and knowledge of paint history. Once the assessment is made, representative samples for different types of components should be taken for determining which of the components are hazardous. This approach reduces total quantities of hazardous waste through source characterization and segregation. This approach may be preferred by abatement contractors and/or housing project owners who are concerned about the cost of hazardous waste management.

   If waste has been already generated, then follow the steps discussed next:

   Estimate the total weight or mass of the debris before it is removed from the dwelling. Collect samples so that each major component of the debris is present in approximately the correct proportion, including the entire cross-section of the substrate. Alternatively, if the waste includes different types of materials, it may be most appropriate to sample from representative areas of a waste pile or from representative containers. For example, if doors and windows are to be sampled, and the door is 20 percent of the waste and the window is 10 percent of the waste, the sample should contain 2 parts door for each window part. Take a core (plug) sample of both the door and the window and combine it in the correct proportion, including the substrate and the surface paint on both sides.

3. Should samples be analyzed as intact pieces or should the material be cut into smaller pieces or ground into small particles?

   The laboratory conducting the analysis is required to cut the representative sample of the waste into pieces that will pass through a specific sieve size (generally 9.5 mm cubes will

fit). The sample should not be ground up, but rather cut into small pieces (*e.g.*, ¼ inch hole saw plugs). The contractor should work with the laboratory to develop a standard procedure for sample preparation (*e.g.*, agreement should be reached in advance regarding who will be responsible for cutting the material. The laboratory may prefer a larger piece of waste which could then be cut into smaller pieces that would pass through the specified sieve size as a sample preparation step performed in the laboratory.

4. Who can I call for more information on TCLP sampling and analysis?

   EPA maintains two hotlines equipped to answer such questions. The general RCRA hotline number is 1-800-424-9346. RCRA hotline staff can answer RCRA questions, including TCLP sampling and analysis. EPA also runs a second hotline dedicated to SW-846 sampling methods at (703) 821-4789.

5. How should I go about selecting a laboratory to conduct TCLP analysis?

   As a first step, identify a list of potential labs that perform the TCLP in your area. Such a list can be obtained from other property owners and/or contractors who have used labs for this purpose. Most states also maintain a list of accredited or registered labs. A small number of states accredit labs for TCLP testing (e.g., California). The American Industrial Hygiene Association (703) 849-8888 and the American Association of Laboratory Accreditation (301) 670-1277 can also provide lists of laboratories in your area. Below are several questions that may be helpful in interviewing potential labs.

   · Is the lab located in a state that accredits labs for TCLP testing (e.g., California)? If so, are they accredited?

   · Does the lab have written sample preparation procedures (i.e., how do they prepare the sample to undergo the leaching procedure)?

   · Does the lab have their own lab-specific written procedures for performing the TCLP (not just a copy of federal guidance)?

   · What quality control procedures are used to ensure data are accurate (e.g., multiple reviews of results)?

   · What will the final report look like? For example, will it specify detection limits and sample preparation techniques used?

   · What is the turn around time and cost of performing the TCLP? (Note that an average price for running a TCLP test for lead only is between $60 - $100.)

Appendix 10.1: State and Territorial Hazardous Waste Management Agencies

Alabama
Land Division
Alabama Dept of Environmental Mgmt
PO Box 463
Montgomery, AL 36130-1463
(205) 271-7730

Alaska
Alaska Dept of Environmental Conservation
Div of Environmental Quality
Hazardous Waste Management Program
410 Wiloughby Avenue
Juneau, AK 99801-1795
(997) 465-5150

American Samoa
Environmental Quality Commission
Government of American Samoa
Pago Pago, American Samoa 96799
011-684-633-2304

Arizona
Office of Waste and Water Quality Mgmt
Arizona Dept. of Environmental Quality
3033 North Central Avenue, Room 304
Phoenix, AZ 85012
(602) 207-2305

Arkansas
Hazardous Waste Division
Arkansas Dept. of Pollution Control & Energy
PO Box 9583-8913
Little Rock, AR 72219-8913
(501) 570-2872

California
Dept. of Toxic Substances
PO Box 806-95812-0806
400 P Street
Sacramento, CA 95814
(916) 324-1826

Colorado
Hazardous Materials & Waste Mgmt Div
Colorado Dept of Health
4300 Cherry Creek Drive, South
Denver, CO 80222
(303) 692-3300

Commonwealth of Northern Mariana Islands
Division of Environmental Quality
Dept of Public Health & Environmental Svcs
Commonwealth of the Northern Mariana Islands
Office of the Governor
Saipan, Mariana Islands 96950
011-670-234-6114

Connecticut
Waste Engineering and Enforcement Division
Dept of Environmental Protection
State Office Building
79 Elm Street
Hartford, CT 06106
(203) 566-5712

Delaware
Hazardous Waste Management Branch
Division of Air & Waste Management
Dept of Natural Resources & Environmental Control
PO Box 1401, 89 Kings Highway
Dover, DE 19903
(302) 739-3689

District of Columbia
Pesticides and Hazardous Materials Division
Dept of Consumer and Regulatory Affairs
2100 Martin Luther King Ave., SE, Rm 203
Washington, DC 20032
(202) 404-3194

Florida
Division of Waste Management (UST)
Dept of Environmental Regulations
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400
(904) 488-0190

Georgia
Hazardous Waste Management Branch
Floyd Towers East/Room 1154
205 Butler Street, SE
Atlanta, GA 30334
(404) 656-2833

Guam
Hazardous Waste Management Program
Guam Environmental Protection Agency
PO Box 2999
Agana, Guam 96910
011-671-646-5300

Hawaii
Dept of Health
Solid & Hazardous Waste Bureau
5 Waterfront Plaza, Suite 250
500 Ala Moana Boulevard
Honolulu, HI 96813
(808) 586-4225

Idaho
Dept of Environmental Quality
Dept of Health & Welfare
1410 North Hilton
Boise, ID 83706
(208) 334-5879

Illinois
Bureau of Land Pollution Control
Illinois Environmental Protection Agency
220 Churchill Road
Springfield, IL 62706
(217) 782-6760

Indiana
Indiana Dept of Environmental Management
105 G. Meridian Street
PO Box 6015
Indianapolis, IN 46206-6015
(317) 232-3210

Iowa
Air Quality and Solid Waste Protection
Dept of Water, Air & Waste Management
900 East Grand Avenue
Henry A. Wallace Building
Des Moines, IA 50319-0034
(515) 281-5145

Kansas
Bureau of Waste Management
Dept of Health & Environment
Forbes Field, Building 740
Topeka, KS 66620
(913) 296-1600

Kentucky
Division of Waste Management
Dept of Environmental Protection
Cabinet of Natural Resources & Environmental Protection
Fort Boone Plaza, Building #2
14 Riley Road
Frankfort, KY 40601
(502) 564-6716

Louisiana
Hazardous Waste Division
Office of Solid & Hazardous
Louisiana Dept of Environmental Quality
PO Box 82718-70884-2178
7290 Blue Bonnet, 5th Floor
Baton Rouge, LA 72810
(504) 765-0355

Maine
Bureau of Hazardous Material & Solid Waste Control
Dept of Environmental Protection
State House Station #17
Augusta, ME 04333
(207) 287-2651

Maryland
Waste Management Administration
Maryland Dept of the Environment
2500 Broening Highway
Baltimore, MD 21224
(410) 631-3304

Massachusetts
Division of Hazardous Waste
Massachusetts Dept of Environmental Protection
One Winter Street, 7th Floor
Boston, MA 02108
(617) 292-5853

Michigan
Waste Management Division
Environmental Protection Bureau
Dept of Natural Resources
Box 30241
Lansing, MI 48909
(517) 373-2730

Minnesota
Minnesota Pollution Control Agency
520 Lafayette Road, North
St. Paul, MN 55155
(612) 297-8503

Mississippi
Division of Hazardous Waste Management
Mississippi Dept of Environmental Quality
Office of Pollution Control
PO Box 10385
Jackson, MS 39289-0385
(601) 961-5063

Missouri
Division of Environmental Quality
Hazardous Waste Program
Dept of Natural Resources
Jefferson Building
205 Jefferson Street, 13th & 14th Floor
PO Box 176
Jefferson City, MO 65102
(314) 751-3176

Montana
Solid and Hazardous Bureau
Dept of Health and Environmental Sciences
Cogswell Building
Helena, MT 59620
(406) 444-1430

Nebraska
Hazardous Waste Management Section
Dept of Environmental Quality
PO Box 98922
Lincoln, NE 68509
(402) 471-2186

Nevada
Waste Management Program
Division of Environmental Protection
Dept of Conservation & Natural Resources
Capital Complex
333 West Nye Lane
Carson City, NV 89710
(702) 687-4670

New Hampshire
Dept of Environmental Services
Waste Management Division
Health & Human Services Building
6 Hazen Drive
Concord, NH 03301-6509
(603) 271-2900

New Jersey
Division of Waste Management
Dept of Environmental Protection
401 East State Street (CN 028)
Trenton, NJ 08625
(609) 292-8341

New Mexico
Hazardous & Radioactive Material Bureau
New Mexico Environmental Dept
PO Box 26110
Sante Fe, NM 87502
(505) 827-4358

New York
Hazardous Waste Remediation
Dept of Environmental Conservation
50 Wolfe Road, Room 209
Albany, NY 12233-7010
(518) 457-6603

North Carolina
Hazardous Waste Section
Division of Solid Waste Management
Dept of Environment Health & Natural Resources
401 Obertin Road, Suite 150
Raleigh, NC 27605
(919) 733-2178

North Dakota
Division of Waste Management
Dept of Health & Consolidated Laboratories
PO Box 5520
Bismarck, ND 58502-5520
(701) 221-5166

Ohio
Division of Hazardous Waste Management
Ohio Environmental Protection Agency
1800 Watermark Drive
PO Box 1049
Columbus, OH 43266-0149
(614) 644-2917

Oklahoma
Hazardous Waste Management Services
Oklahoma State Dept of Health
1000 NE 10th Street
Oklahoma City, OK 73117-1299
(405) 271-5338

Oregon
Hazardous & Solid Waste Division
Dept of Environmental Quality
811 SW 6th Avenue
Portland, OR 97204
(503) 229-5356

Pennsylvania
Bureau of Waste Management
Pennsylvania Dept of Environmental Resources
PO Box 8471, 14th Floor MSSOB
Harrisburg, PA 17105
(717) 787-9870

Puerto Rico
Environmental Quality Board
Santurce, PR 00910-1488
1 (809) 725-5333

Rhode Island
Division of Waste Management
Dept of Environmental Management
291 Promenade Street
Providence, RI 02908
(401) 277-2808

South Carolina
Bureau of Solid & Hazardous Waste Management
Dept of Health & Environmental Control
2600 Bull Street
Columbia, SC 29201
(803) 734-5200

South Dakota
Office of Waste Management
Dept of Environmental & Natural Resources
523 E Capitol
Foss Building, Room 416
Pierre, SD 57501
(605) 773-3153

Tennessee
Division of Solid Waste Management
Tennessee Dept of Environment & Conservation
401 Church Street, L & C Tower
Nashville, TN 37243
(615) 532-0780

Texas
Industrial Hazardous Waste Division
Texas Waster Commission
PO Box 13807
Austin, TX 78711-3087
(512) 908-2334

Utah
Division of Solid & Hazardous Waste
Dept of Environmental Quality
PO Box 144889
288 N 1460 West
Salt Lake City, UT 84114-4880
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Vermont
Hazardous Material Division
Dept of Environmental Conservation
Agency of Natural Resources
103 S Maine Street
Waterbury, VT 05676
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Virgin Islands
Dept of Planning & Natural Resources
Nisky Center, Suite 231
45A Estate Nisky
St. Thomas, VI 00802
(809) 774-6420

Virginia
Waste Division
Dept of Environmental Quality
Monroe Building, 11th Floor
101 N 14th Street
Richmond, VA 23219
(804) 527-5000
(804) 225-2667

Washington
Hazardous Waste Program
Dept of Ecology
PO Box 47600
Olympia, WA 98504-7660
(206) 459-6316

West Virginia
Office of Waste Management
Division of Environmental Protection
Dept Commerce, Labor, Environmental Resources
1356 Hansord Street
Charleston, WV 25301
(304) 558-5393

Wisconsin
Bureau of Solid & Hazardous Waste Mgmt
Dept of Natural Resources
PO Box 7921
Madison, WI 53707
(608) 266-1327

Wyoming
Solid & Hazardous Waste Division
State of Wyoming
Dept of Environmental Quality
122 W 25th Street
Herschler Building
Cheyenne, WY 82002
(307) 777-7752

Appendix 11: One Hour Waiting Period Rationale for Clearance Sampling

This Appendix describes the rationale for why it is necessary to wait no longer than one hour to conduct clearance examinations. Conservative (health protective) assumptions have been made throughout the analysis to ensure that the risk is minimal. The scenario is that no one will enter the room or work area for at least one hour to minimize air turbulence and reentrainment of small particles. The rationale shows why one hour is a safe waiting period and why additional benefits will not be gained by waiting longer.

Settling Velocities

Settling velocities for leaded dust can be estimated by making assumptions on the particle size, density, and shape, as well as the degree of air turbulence. Particles can be assumed to be roughly spherical, with a density of 2.5 g/cm³ (pure lead oxide has a density of 9.5 g/cm³, but since lead-based paint dust contains other materials, a lower density is appropriate). Mineral dust has an average density of 2.5 g/cm³, and normal urban particulate matter is likely to have a density of between 1 - 1.7 g/cm³. Turbulence is expected to be minimal since all movement through the area will have ceased, although some reentrainment of small particles can still be expected due to air currents and building leakage in the area. This is true regardless of the length of time involved. Particles can be expected to vary in size from 0.2 to 250 µm or even larger (Mamane, 1993). Some paints were manufactured with pigment particle sizes on the order of 1 µm. However, it is very unlikely that resins and binders in the paint would break down completely to particles this small. To date, there has been little research conducted on particle size distributions in lead abatement dust, although one pilot study found that 41% of the airborne dust generated during abrasive blasting operations on lead painted bridges was less than 6 µm in diameter (NIOSH, 1993a). The percentage should be much lower in residential work, where abatement methods that produce small particles are prohibited (no blasting, burning, power sanding are permitted).

Larger particles will settle more rapidly than smaller particles. The table below shows terminal settling velocities for different particle sizes with a density of 2.5 g/cm³ (Blume, 1993).

Particle Settling Velocities

Particle Diameter (µm)	Settling Velocity (cm/sec)	Settling Time for a Ceiling Height of 10 feet
0.5	0.0025	34 hours
1.0	0.0088	9 hours
5.0	0.19	26 minutes
10	0.75	7 minutes
100	75	4 seconds

If one assumes that rooms in residential structures are typically 10 feet high, that all the particles are present at the ceiling level and need to travel the full 10 feet from the ceiling to the floor, and that all the particles are about 5 µm in diameter (all health protective assumptions), it can be shown that it would take a little less than half an hour for all particles greater than 5 µm to settle out of the air, assuming that turbulence and reentrainment are low:

$$\frac{10 \text{ feet} \times 2.54 \text{ cm/inch} \times 12 \text{ inch/foot} \times 1 \text{ min/60 sec}}{0.19 \text{ cm/sec}} = 27 \text{ minutes}$$

Therefore, one can assume that by waiting one hour after all cleanup work has been completed, nearly all of the lead particulate greater than 5 µm will have settled out the air to the floor, where it is available for measurement (clearance). In fact, all particles greater than 3 µm will reach the floor in a little more than an hour (70 minutes). Of course, there will always be some ambient air movement and turbulence, even in rooms that have the doorways sealed off with plastic sheets. This is due to ordinary building leakage. Additionally, some turbulence will occur as individuals open the door and re-enter the room. However, all of this reentrainment will occur regardless of how long one waits for particles to settle. Even if these particles do become airborne, it is unlikely that they will contribute substantially to exposures, as shown below.

Contribution of Small Particles to Settled Leaded Dust Levels

For the purpose of this analysis of the impact of air lead levels on clearance status, assume that all these small particles settle out of the room air (a "worst-case" scenario). How will the remaining particulate less than 5 µm affect settled leaded dust levels? Consider the case of a room 10 feet long by 10 feet wide x 10 feet high, for a total volume of 1,000 ft³m. Personal breathing zone airborne lead concentrations reported from the HUD Demonstration Project (NIOSH 1990) during cleaning were reported to be 16 µg/m³, which is the 95th percentile (of the statistical distribution, not the sample distribution). There are several health-protective assumptions in using this number. First, they are personal breathing zone samples. This method of air sampling is not intended to produce a full particle size distribution. Since its purpose is to measure exposure through inhalation, the method over-samples the smaller particle sizes. Second, by selecting the 95th percentile, levels of airborne particulate should be lower in 95 out of a hundred jobs. Finally, these exposures were measured during cleanup activity, not after cleanup activity. It is reasonable to expect that airborne concentrations will decline greatly immediately following active work in the area.

For the purposes of this analysis, if we assume that all of the dust measured by the personal breathing zone samples is less than 5 µm in diameter (even though it is likely that some of it will be much larger) and that the dust is distributed across the floor surface area, it can be shown that the additional contribution to settled leaded dust from airborne leaded dust is very small. Settled leaded dust is the principal route of exposure for children and is the measure of choice for clearance determination.

Using the assumptions as stated, there would be a total of 453 µg of lead suspended in the air in the room:

$$28.3 m^3 \times 16 \mu g/m^3 = 453 \mu g$$

If all of the dust settled out of the air, and if deposition is uniform across the floor surface, then it would contribute no more than an additional 6 µg/ft² to the floor of the room, which measures 10 feet x 10 feet (100 ft²):

$$453 \mu g/100 ft^2 = 4.53 \mu g/ft^2$$

This additional dust loading is well below the routine limit of quantitation for the typical wipe sampling method (25 µg/ft²) and about 6% of the clearance standard of 100 µg/ft² for floors. While it could be argued that deposition is unlikely to be uniform, this would mean simply that there would be "hot spots" with higher loadings and corresponding "cold spots" where loadings would be lower. The existing clearance standards are geared toward average settled leaded dust levels; therefore, the average across the floor is the best way to characterize the contribution of the airborne dust to settled dust.

The result of this exercise shows two things:

- Most leaded dust generated during residential abatement or interim control activity is likely to settle out of the air relatively quickly if turbulence is kept reasonably low for about an hour after the work has been completed. Ambient air currents will always be present and may cause some reentrainment no matter how long one waits.

- The contribution of airborne leaded dust to settled leaded dust immediately following cleanup is likely to be very small and virtually non-detectable.

These results have important implications. It does not appear to be necessary to wait 24 hours after cleaning before collecting clearance dust samples (as previously suggested in the HUD public housing guidelines). This decreases the amount of time required for clearance testing, reducing the expense of resident relocation.

Airborne Lead

Finally, it is worthwhile to consider the extent of airborne dust exposure. At first glance, 16 µg/m³ appears to be well above the EPA National Ambient Air Quality Standard (NAAQS) for Lead (1.5 µg/m³). However, the NAAQS is a quarterly average designed to protect the population from long-term chronic exposure, while the HUD Demonstration air sampling data are approximately two-hour time weighted averages. The use of a quarterly average is not appropriate for a short term exposure. Furthermore, there is no evidence that air cleaning machines (so-called "negative air" machines) provide any benefit in removing particles from the air. In fact, at least one NIOSH study found no correlation at all between worker exposures and the use of these machines, although there was a significant correlation with the use of HEPA vacuums and airborne lead (NIOSH 1992b). Finally, it should be evident that air lead levels will drop greatly as the doors and windows are opened. The 453 µg in the room should rapidly

dissipate to negligible levels. Again, this dilution process will occur regardless of how long one waits to enter the area, whether it be one hour or 24 hours.

The results of this analysis should be validated through field research at on-going abatement jobs and through pilot testing.

Appendix 12: Statistical Rationale for Sample Sizes and Percentages Used in Guidance for Inspecting in Multifamily Housing

This appendix presents the statistical rationale and calculations used to develop sample sizes (number of units to be tested) in multifamily housing. The samples sizes apply both to inspections for lead-based paint and to post-abatement dust clearance testing in multifamily housing. The appendix also presents the detection capability of the sampling scheme, that is, the probability that the scheme will successfully detect various levels of contamination in the housing development tested.

A12.1 Sample Size Calculations

To determine the applicable sample size using the methods of this appendix, the housing units must first be properly grouped. For lead-based paint inspections, similar units and buildings should be grouped based on common construction, floor plans, and painting history. This type of grouping will make it less likely that lead-based paint will be missed in the testing. Likewise, for dust clearance testing, units and buildings that have similar construction and were cleaned in the same manner, should be grouped for sampling purposes.

Because the sampling scheme applies to both testing for lead-based paint inspections and dust clearance testing, the term "the HUD standard" will be used to mean either 1.0 mg/cm² for lead-based paint inspections or the applicable clearance standard for dust testing. The term "component" means a floor, window sill or window well for dust clearance testing, and means any painted building component for lead-based paint inspections.

The basic specification for the sampling scheme is that it achieve 95% confidence that at least 95% of the units meet the HUD standard. This means that, if all units sampled meet the HUD standard for all components tested, there is 95% confidence that fewer than 5% of the units in the development have one or more components in violation of the HUD standard, assuming no within unit sampling error and no measurement error. An alternate interpretation is that up to a 5% chance of missing some lead in up to 5% of the units is allowed. In a large development, 5% of the units might be a large absolute number, however, so the total number of leaded units which might escape detection has been limited to 50. This leads to the following quantitative prescription for the sampling plan:

TEST THE SMALLEST NUMBER OF UNITS WITH THE PROPERTY THAT, IF ALL TESTED UNITS ARE AT OR BELOW THE HUD STANDARD FOR ALL COMPONENTS, THERE IS 95% CONFIDENCE THAT THE NUMBER OF UNITS WITH AT LEAST ONE COMPONENT AT OR ABOVE THE HUD STANDARD IS LESS THAN 50 UNITS OR 5%, WHICHEVER IS SMALLER.

As an example, 56 units should be tested in a 600 unit development. Sample sizes where taken from Table 7.3 of Chapter 7 (or Table IV in this appendix). If no lead (above the HUD standard)

is found in any of the 56 tested units, the owner of the development can be 95% confident that less than 30 units (the lesser of 50 and 5% of 600) have lead above the HUD standard. As a second example, 232 units should be tested in a 4000 unit development. If all are below the dust clearance HUD standard for all tested floors, window sills and window troughs, there is 95% confidence that less than 50 of the 4000 units (the lesser of 50 and 5% of 4000) have any lead dust levels at or above the applicable HUD standard. Note that developments with 20 or fewer units, all units should be tested and the classification rules for single-family housing apply.

The statistical calculations required to determine the number of units to be tested, based on the criterion above, are fairly straightforward. For the sake of brevity, call a unit with one or more components with lead-based paint (or dust lead, as the case may be) at or above the HUD standard a "leaded unit". Make the following definitions:

N = Total number of units in the development;

k = Maximum allowable number of leaded units;

n = Smallest number of units which must be tested to provide 95% confidence that the total number of leaded units is "k" or less, based on finding no leaded units in the sample tested.

For example, if 95% confidence is required that less than 5% of 300 units have lead, then k = 14. If fewer than 50 out of 4000 with lead is required, then k = 49.

In the usual statistical convention, "n" is defined as the smallest integer for which the probability of obtaining no positive results in a simple random sample of size "n" from a population of size "N", of which k+1[1] are positive, is less than 0.05. When k+1 of "N" total are positive, the probability of observing no positive results in a simple random sample of size "n" is given by the hypergeometric formula[1]:

$$[(N-k-1)...(N-k-n)]/[(N)(N-1)...(N-n+1)].$$

The required value of "n" is obtained by successively evaluating this expression for n = 1, 2, 3,..., until its value first drops below 0.05. The calculations were performed in SAS[2], using the hypergeometric distribution function[1]. Table I shows the exact values of "k" and "n" for selected values of "N".

In developing the sample sizes for Table 7.3 of Chapter 7 (Table 7.3 has been reproduced as Table IV in this appendix), two refinements to the calculations were made. First, because of the discrete nature of the problem, it is possible for the sample size to decrease when the total number of units increases. To see how this happens, suppose that a building has 40 units. Since 5% of 40 is two, the maximum number of leaded units allowed is 1. However, if the building

[1] k+1 is used to determine the probability for at most k positive values. This assures that the occurrence of k positive values will have probability less than 0.05.

has 41 units, 5% of 41 is 2.05, so the maximum number of leaded units is 2. Since it is obviously easier to detect 2 units out of 41 than 1 out of 40, the minimum sample size for a building with 41 units is smaller than the minimum sample size for a building with 40 units. Specifically, the exact sample size for 40 units is 31, while the exact sample size for 41 units is 26. The same problem occurs every time the number of units is a multiple of 20. Since it is extremely counter-intuitive for the sample size to decrease when the number of units increases, the additional requirement that the sample size never decrease was imposed. The result of this requirement, which can be observed clearly in Table 7.3, is that the sample size remains constant for some time beginning at each multiple of 20.

The second refinement to the calculation was to calculate a percentage of units to be sampled when the total number of units is very large. When the total number of units is 1,000 or greater, the maximum acceptable number of leaded units is 49. Suppose that a proportion "P" of the N units is to be tested when N is large. Then, when the number of leaded units is 50, the minimum unacceptable number, the probability that zero leaded units will be found in the sample can be approximated by $(1-P)^{50} = 0.05$ if P=0.058. (The ratio of n to N in Table I is approximately 0.058 for N greater than 1000). Thus, the limiting percentage for the sample size is 5.8%. In Table 7.3, the sample size is taken as 5.8% of the number of units, rounded to the nearest whole number, when N is 1,040 or larger.

A12.2 Detection Capability of the Sampling Scheme

By the detection capability of the sampling scheme is meant the probability that the sample contains at least one leaded unit when leaded units are present. Thus, the detection capability is the probability that a problem (lead-based paint or dust above the applicable HUD standard) will be detected in the development, in the sense of showing up in at least one of the units in the sample.

The detection capability of the sampling scheme depends on the total number of leaded units in the development as a whole. Clearly, the more leaded units there are, the better the chance that they will appear in the sample. When the number of leaded units is k+1 (in Table I), the detection capability is, by definition, (slightly) greater than 95%. In general, when the number of leaded units is "L", the detection capability is calculated from the formula

$$1 - [(N-L)(N-L-1)...(N-L-n+1)]/[(N)(N-1)...(N-n+1)]$$

where "N" and "n" are, respectively, the total number of units in the development, and the sample size. Table II shows the number of leaded units which must be present in the development as a whole for the detection capability to be 50%, 75%, 90%, 95%, 97.5%, or 99%.

As an example, the detection capability of the scheme in a 600-unit development is 99% when the development contains 45 leaded units. This means that the sample of 56 units in a 600-unit development is 99% certain to include at least one of the 45 leaded units. Notice that the numbers are almost exactly the same for all developments with 1,000 units or more. This reflects the design decision that the number of leaded units which may be missed completely (with 5% probability) must be less than 50. Of course, the fixed numbers in the table reflect a decreasing percentage of the total number of units in the development. Table III shows the percentage of

leaded units which must be present to achieve the various detection capabilities.

For example, in a 1,000-unit development, the detection capability of the scheme is 75% when 2.4% of the units are leaded. That is, the sample of 57 units tested is 75% sure to contain at least one of the 2.4% of units which are leaded. Put another way, although 97.6% of the units have no lead above the HUD standard, a random sample of only 5.7% of the units has a 75% chance of finding one of the leaded units. The percentages in Table III are fixed (except for roundoff) for developments with 200 - 1,000 units, and then decline for larger developments. Again, this is the result of the design decision to fix the percentage of leaded units which may be missed (with 5% probability), for developments with 1,000 units or less. For larger developments, the number of such units is fixed, but the percentage is declining.

Tables II and III give probabilities of finding at least one leaded unit in the tested sample. This does not mean that all, or even most, of the leaded units will be sampled. To achieve this would require virtually 100% sampling. The expected percentage of the leaded units which will be sampled is equivalent to the sampling percentage, i.e., the sample size as a percentage of the number of units in the development. For example, in a 100-unit development, 45 units are sampled. Thus, 45% of the leaded units would also be expected to be sampled, on average. In a 1,000-unit development, an average of 5.7% of the leaded units would be sampled.

TABLE I

Calculation of the Number of Units to be Tested

N[a]	k[b]	n[c]
20	0	20
40	1	31
60	2	38
80	3	42
100	4	45
200	9	51
300	14	54
400	19	55
600	29	56
1,000	49	57
1,500	49	86
2,000	49	115
2,500	49	144
3,000	49	174
3,500	49	203
4,000	49	232

Calculation of the Number of Units to be Tested		
N[a]	k[b]	n[c]
4,500	49	261
5,000	49	290

[a]N = Number of Units in the Development
[b]k = Maximum Allowable Number of Leaded Units
[c]n = Number of Units to be Tested

TABLE II

N[a]	n[b]	Number of Leaded Units in Development Needed for Detection Capability to be:					
		50%	75%	90%	95%	97.5%	99%
20	20	1	1	1	1	1	1
40	31	1	1	2	2	3	3
60	38	1	2	3	3	4	5
80	42	1	2	3	4	5	6
100	45	2	3	4	5	6	8
200	51	3	5	8	10	12	15
300	54	4	7	12	15	18	23
400	55	5	10	16	20	25	30
600	56	7	14	23	30	37	45
1,000	57	12	24	39	50	61	75
1,500	86	12	24	39	50	61	76
2,000	115	12	24	39	50	61	76
2,500	144	12	24	39	50	62	76
3,000	174	12	24	39	50	62	76
3,500	203	12	24	39	50	62	76
4,000	232	12	24	39	50	62	76
4,500	261	12	24	39	50	62	76
5,000	290	12	24	39	50	62	76

[a]N = Number of Units in the Development
[b]n = Number of Units Tested

TABLE III

N[a]	n[b]	Percentage of Leaded Units in Development Needed for Detection Capability to be:					
		50%	75%	90%	95%	97.5%	99%
20	20	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
40	31	2.5%	2.5%	5.0%	5.0%	7.5%	7.5%
60	38	1.7%	3.3%	5.0%	5.0%	6.7%	8.3%
80	42	1.3%	2.5%	3.8%	5.0%	6.3%	7.5%
100	45	2.0%	3.0%	4.0%	5.0%	6.0%	8.0%
200	51	1.5%	2.5%	4.0%	5.0%	6.0%	7.5%
300	54	1.3%	2.3%	4.0%	5.0%	6.0%	7.7%
400	55	1.3%	2.5%	4.0%	5.0%	6.3%	7.5%
600	56	1.2%	2.3%	3.8%	5.0%	6.2%	7.5%
1,000	57	1.2%	2.4%	3.9%	5.0%	6.1%	7.5%
1,500	86	0.8%	1.6%	2.6%	3.3%	4.1%	5.1%
2,000	115	0.6%	1.2%	2.0%	2.5%	3.1%	3.8%
2,500	144	0.5%	1.0%	1.6%	2.0%	2.5%	3%
3,000	174	0.4%	0.8%	1.3%	1.7%	2.1%	2.5%
3,500	203	0.3%	0.7%	1.1%	1.4%	1.8%	2.2%
4,000	232	0.3%	0.6%	1.0%	1.3%	1.6%	1.9%
4,500	261	0.3%	0.5%	0.9%	1.1%	1.4%	1.7%
5,000	290	0.2%	0.5%	0.8%	1.0%	1.2%	1.5%

[a]N = Number of Units in the Development
[b]n = Number of Units Tested

TABLE IV
Number of Units to Be Tested in Multifamily Developments

Number of Units in Building or Group of Similar Buildings	Number of Units to Be Tested
21–26	20
27	21
28	22
29–30	23
31	24
32	25
33–34	26
35	27
36	28
37	29
38–39	30
40–50	31
51	32
52–53	33
54	34
55–56	35
57–58	36
59	37
60–73	38
74–75	39
76–77	40
78–79	41
80–95	42
96–97	43
98–99	44
100–117	45
118–119	46
120–138	47
139–157	48
158—177	49
178–197	50
198–218	51
219–258	52
259–299	53
300–379	54
380–499	55
500–776	56
777–1004	57
1005-1022	58
1023-1039	59

For buildings or groups of similar buildings with 1,040 units or more, test 5.8 percent of the number of units, rounded to the nearest unit. EXAMPLE: If there are 2,170 units, 5.8 percent

A12.3 Sample Size and Decision Percentages in the Multifamily Decision Flowchart

To obtain 99% confidence on conclusions made about a component type using the multifamily decision flowchart in Chapter 7, XRF readings must be taken on at least 40 components of the given type. A sample size of 40 was chosen as a minimum sample size that could be achieved in almost all cases given that at least 20 units would be tested in a multifamily housing development.

For simplicity, a single percentage was desired for declaring a component type either positive or negative in multifamily housing. The decision rule in the flowchart to declare a component type positive is based on the percentage of XRF readings classified as positive relative to the HUD standard and the decision rule to declare a component type negative is based on the percentage of XRF readings less than the HUD 1.0 mg/cm² standard, assuming a 5% false positive rate and a sample size of at least 40. Parameters provided in the *XRF Performance Characteristics Sheet* for each specific XRF instrument were developed so that the false positive rate would be 5%. Thus, for sample sizes of 40 or greater and when operating an XRF instrument as specified in the *XRF Performance Characteristics Sheet*, 99% confidence may be obtained for the following:

- At least one component of a given type has lead in paint equal or greater than the HUD standard if 15% of the components are classified as positive relative to the HUD standard.
- None of the components of a given type have lead in paint greater than the HUD standard if 100% of the XRF readings taken on the components of a given type are less than 1.0 mg/cm².

The statistical rationale for the percentages used in the decision rules of the flowchart are given below.

Positive Percentage in Multifamily Decision Flowchart

The Multifamily Decision Flowchart (Figure 7.11 of Chapter 7) gives the following rule: based on XRF readings, if 15% or more components of a given type are classified as positive relative to the HUD standard, then the inspector concludes that lead is present at 1.0 mg/cm² or greater on at least one of the components of the type tested. Assuming a true false positive rate of 5%, the 99th percentiles of the observed number and percentage of false positive classifications for several sample sizes are shown below in Table V.

TABLE V

Sample Size	Number of False Positive Results	Percentage of False Positive Results
20	4	20
40	**6**	**15**
60	7	12
80	9	11
100	11	11

With a sample size of at least 40 for a component type and if the components all have true lead levels less than the HUD standard (1.0 mg/cm²), there is only a 1% probability of observing 15% or more positive results. In other words, if 15% or more results are actually observed on a component type, one can be

99% confident that lead is present on at least one of the components of a given type. Since 15% is the percentage that corresponds with a sample size of 40, 15% was adopted as the cutoff percentage for declaring a component type positive relative to the HUD standard in Chapter 7.

Negative Percentage in Multifamily Decision Flowchart

The flowchart specifies that if 100% of the XRF readings taken on components of a given type are less than 1.0 mg/cm², the conclusion is that no lead is present at or above the 1.0 mg/cm² HUD standard on the component type.

Given that the sample size must be at least 40 (as described above), suppose that exactly 1 of the 40 components tested has true lead level of 1.0 mg/cm² or greater. Then, the probability of obtaining an XRF reading less than 1.0 mg/cm² on all (100%) of the components of the given type is:

$$\begin{aligned}&\Pr(\text{All XRF readings} < 1.0\ \text{mg/cm}^2) = \\ &\quad \Pr(1\ \text{true lead level} \geq 1.0\ \text{mg/cm}^2\ \text{has XRF reading} < 1.0\ \text{mg/cm}^2) \\ &\quad * \Pr(39\ \text{true lead levels} < 1.0\ \text{mg/cm}^2\ \text{have XRF readings} < 1.0\ \text{mg/cm}^2) \\ &\quad = p_1 \times p^{239},\end{aligned}$$

where

p_1 = probability a true lead ≥ 1.0 mg/cm² has XRF reading < 1.0 mg/cm²
p_2 = probability a true lead < 1.0 mg/cm² has XRF reading < 1.0 mg/cm²

The maximum value of this expression using results from XRF instruments examined by EPA in a large field study[3] was 0.017. Thus, if one or more of the 40 components is truly positive (lead level 1.0 mg/cm² or greater) relative to the HUD standard, there is less than a 2% chance of obtaining XRF readings less than 1.0 mg/cm² on all (100%) components of the component types. This means that, whenever all XRF readings on a component of a given type are less than 1.0 mg/cm², there is at least 98% confidence that none of the 40 components have true lead above 1.0 mg/cm².

With the application of the flowchart and with a sample size of 40, there is a very high probability (at least 98 percent) that a tested component type will be correctly classified. Combined with the 95 percent probability that at least one leaded component will be selected for inspection by the sampling scheme described above when 5 percent or more of the components have lead-based paint at or above 1.0 mg/cm², the procedure provides an overall confidence level of between 93 percent and 95 percent.

A12.4 References

[1] W. Feller (1968), *An Introduction to Probability Theory and its Applications, Volume I*, Third Edition, Wiley, New York.

[2] SAS Institute Inc., Cary NC 27512-8000.

[3] Lead-Based Paint Testing: Field Study Technical Report, U.S. Environmental Protection Agency report, in press.

Appendix 13.1: Wipe Sampling for Settled Lead-Contaminated Dust

Wipe samples for settled leaded dust can be collected from floors (both carpeted and uncarpeted), interior and sash/sill contact areas, and other reasonably smooth surfaces. Wherever possible, hard surfaces should be sampled. Wipe media should be sufficiently durable so that it is not easily torn, but can be easily digested in the laboratory. Recovery rates of between 80-120% of the true value should be obtained for all media used for wipe sampling. Blank media should contain no more than 25 µg/wipe (the detection limit using Flame Atomic Absorption). Additional standards for wipe sampling can be found by consulting ASTM ES 30-94.

1. Wipe Sampling Materials and Supplies

a. Type of disposable wipe: Any wipe material that meets the following criteria may be used:

(i) Contains low background lead levels (less than 5 µg/wipe)
(ii) Is a single thickness
(iii) Is durable and does not tear easily (do not use Whatman™ filters)
(iv) Does not contain aloe
(v) Can be digested in the laboratory
(vi) Has been shown to yield 80-120% recovery rates from samples spiked with leaded dust (not lead in solution)
(vii) Must remain moist during the wipe sampling process (wipes containing alcohol may be used as long as they do not dry out)

Examples of acceptable wipe media include: "Little Ones Baby Wash Cloths™," "Little Ones Baby Wipes Natural Formula™," or "Little Ones Baby Wipes Lightly Scented™," available at K-Mart Stores. This product is also available under the brand names "Pure and Gentle Baby Wipes™" and "Fame Baby Wipes™." Individually-packaged "Wash'n Dri Wipes" are also acceptable. "Wet Wipes," which are available at Walgreens and other stores, may also be used. Other brands are also acceptable if equivalence in both lead contamination (analysis of blanks) and laboratory digestion recoveries (analysis of wipes spiked with known amounts of leaded dust, not lead in solution) can be established. The wipes listed above have proven to be sufficiently durable under field use and to have acceptable recovery rates. Do not use "Little Ones Diaper Wipes," also available at K-Mart stores, or any other brand of wipes for which recovery data have not been established. Do not use wipes that contain aloe. Wipes that contain alcohol may be used as long as they do not dry out during the wipe process.

b. Non-sterilized non-powdered disposable gloves. Disposable gloves are required to prevent cross-sample contamination from hands.

c. Non-sterilized polyethylene centrifuge tubes (50 ml size) or equivalent hard-shell container that can be rinsed quantitatively in the laboratory.

d. Dust sample collection forms contained in these Guidelines

e. Camera & Film to document exact locations (Optional)

f. Template Options

i. Masking tape. Masking tape is used on-site to define the area to be wiped. Masking tape is required when wiping window sills and window wells in order to avoid contact with window jambs and channel edges. Masking tape on floors is used to outline the exact area to be wiped.

ii. Hard, smooth, reusable templates made of laminated paper, metal, or plastic. Note: Periodic wipe samples should be taken from the templates to determine if the template is contaminated. Disposable templates are also permitted so long as they are not used for more than a single surface. Templates must be larger than 0.1 ft^2, but smaller than 2 ft^2. Templates for floors are typically 1 ft^2. Templates are usually not used for windows due to the variability in size and shape (use masking tape instead).

g. Container labels or permanent marker.

h. Trash bag or other receptacle (do not use pockets or trash containers at the residence).

i. Rack, bag, or box to carry tubes (optional)

j. Measuring tape

k. Disposable shoe coverings (optional)

2. Single Surface Wipe Sampling Procedure

a. Outline Wipe Area:

Floors: Identify the area to be wiped. Do not walk on or touch the surface to be sampled (the wipe area). Apply adhesive tape to perimeter of the wipe area to form a square or rectangle of about one square foot. No measurement is required at this time. The tape should be positioned in a straight line and corners should be nominally perpendicular. When putting down any template, do not touch the interior wipe area.

Window sills and other rectangular surfaces: Identify the area to be wiped. Do not touch the wipe area. Apply two strips of adhesive tape across the sill to define a

wipe area at least 0.1 square foot in size (approx. 4 inches x 4 inches).

When using tape, do not cross the boundary tape or floor markings, but be sure to wipe the entire sampling area. It is permissible to touch the tape with the wipe, but not the surface beyond the tape.

b. Preliminary inspection of the disposable wipes:

Inspect the wipes to determine if they are moist. If they have dried out, do not use them. When using a container that dispenses wipes through a "pop-up" lid, the first wipe in the dispenser at the beginning of the day should be thrown away. The first wipe may be contaminated by the lid and is likely to have dried to some extent. Rotate the container before starting to ensure liquid inside the container contacts the wipes.

c. Preparation of centrifuge tubes:

Examine the centrifuge tubes and make sure that the tubes match the tubes containing the blind spiked wipe samples. Partially unscrew the cap on the centrifuge tube to be sure that it can be opened. Do not use plastic baggies to transport or temporarily hold wipe samples. The laboratory cannot measure lead left on the interior surface of the baggie.

d. Gloves

Don a disposable glove on one hand; use a new glove for each sample collected. If two hands are necessary to handle the sample, use two new gloves, one for each hand. It is not necessary to wipe the gloved hand before sampling. Use a new glove for each sample collected.

e. Initial placement of wipe:

Place the wipe at one corner of the surface to be wiped with wipe fully opened and flat on the surface.

f. First wipe pass - (side-to-side):

With the fingers together, grasp the wipe between the thumb and the palm. Press down firmly, but not excessively with both the palm and fingers (do not use the heel of the hand). Do not touch the surface with the thumb. If the wipe area is a square, proceed to wipe side-to-side with as many "S"-like motions as are necessary to completely cover the entire wipe area. (See step h for non- square areas.) Exerting excessive pressure on the wipe will cause it to curl. Exerting too little pressure will result in poor collection of dust. Do not use only the fingertips to hold down the wipe, because there will not be complete contact with the surface and some dust may be missed. Attempt to remove all visible dust from the wipe area.

g. Second wipe pass - (top-to-bottom):

Fold the wipe in half with the contaminated side facing inward. (The wipe can be straightened out by laying it on the wipe area, contaminated side up, and folding it over.) Once folded, place in the top corner of the wipe area and press down firmly with the palm and fingers. Repeat wiping the area with "S"-like motions, but on the second pass, move in a top-to-bottom direction. Attempt to remove all visible dust. Do not touch the contaminated side of the wipe with the hand or fingers. Do not shake the wipe in an attempt to straighten it out, since dust may be lost during shaking.

h. Rectangular areas (e.g. window sills):

If the surface is a rectangle (such as a window sill), two side-to-side passes must be made over half of this surface, the second pass with the wipe folded so that the contaminated side faces inward. For a window sill, do not attempt to wipe the irregular edges presented by the contour of the window channel. Avoid touching other portions of the window with the wipe. If there are paint chips or gross debris in the window sill, attempt to include as much of it as possible on the wipe. If all of the material cannot be picked up with one wipe, field personnel may use a second wipe at their discretion and insert it in the same container. Consult with the analytical laboratory to determine if they can perform analysis of two wipes as a single sample. When performing single-surface sampling, do not use more than two single surface wipes for each container. If heavily dust-laden, a smaller area should be wiped. It is not necessary to wipe the entire window well but do not wipe less than 0.10 ft^2 (approx 4" x 4").

i. Packaging the Wipe:

After wiping, fold the wipe with the contaminated side facing inward again, and insert aseptically (without touching anything else) into the centrifuge tube or other hard-shelled container. If gross debris is present, such as paint chips in a window well, make every attempt to include as much of the debris as possible in the wipe.

j. Labelling the Centrifuge tube:

Seal the tube and label with the appropriate identifier. Record the laboratory submittal sample number on the field sampling form (see Chapters 5 and 14).

k. Area Measurement:

After sampling, measure the surface area wiped to the nearest eighth of an inch using a tape measure or a ruler. The size of the area wiped must be at least 0.10 ft^2 in order to obtain an adequate limit of quantitation (25 µg/wipe is the typical detection limit with flame AA; 25 µg/0.10 square feet = 250 µg/ft^2, which is half of the HUD clearance criterion for interior window sills). No more than 2 square feet should be

wiped with the same wipe or else the wipe may fall apart. Record specific measurements for each area wiped on the field sampling form.

l. Form Completion

Fill out the appropriate field sampling forms (see Form 5.4 or Form 14.2 in these Guidelines) completely. Collect and maintain any field notes regarding type of wipe used, lot number, collection protocol, etc.

m. Trash Disposal:

After sampling, remove the masking tape and throw it away in a trash bag. Remove the glove; put all contaminated gloves and sampling debris used for the sampling period into a trash bag. Remove the trash bag when leaving the dwelling. Do not throw away gloves or wipes inside the dwelling unit where they could be accessible to young children, resulting in a suffocation hazard.

Repeat steps a. through m. for additional samples in the same dwelling unit.

3. Composite Wipe Sampling

Whenever composite sampling is contemplated, consult with the analytical laboratory to determine if the laboratory is capable of analyzing composite samples. When conducting composite wipe sampling, the procedure stated above should be used with the following modifications:

When outlining the wipe areas (step a), set up all of the areas to be wiped before sampling. The size of these areas should be roughly equivalent, so that one room is not over-sampled.

After preparing the centrifuge tube, put on the glove(s) and complete the wiping procedures for all subsamples (steps e-i). A separate wipe must be used for each area sampled. After wiping each area, carefully insert the wipe sample into the same centrifuge tube (no more than 4 wipes per tube).

Once all subsamples are in the tube, label the tube. Record a separate measurement for each area that is subsampled on the field collection form (see Form 5.4a or Form 14.2a for a sample form). Finally, complete trash disposal (step m), making sure that no masking tape is left behind.

Risk assessors and inspector technicians do not have to remove their gloves between subsample wipes for the same composite sample as long as their gloved hands do not touch an area outside of the wipe areas. If a glove is contaminated, the glove should be immediately replaced with a clean glove.

In addition to these procedural modifications, the following rules for compositing should be observed:

· Separate composite samples are required from carpeted and hard surfaces (*e.g.*, a single

composite sample should not be collected from both carpeted and bare floors).

- Separate composite samples are required from each different component sampled (*e.g.*, a composite sample should not be collected from both floors and window sills).

- Separate composite samples are required for each dwelling

4. Blank Preparation

After sampling the final dwelling unit of the day, but before decontamination, field blank samples should be obtained. Analysis of the field blank samples determines if the sample media is contaminated. Each field blank should be labeled with a unique identifier similar to the others so that the laboratory does not know which sample is the blank (i.e., the laboratory should be "blind" to the blank sample).

Blank wipes are collected by removing a wipe from the container with a new glove, shaking the wipe open, refolding as it occurs during the actual sampling procedure, and then inserting it into the centrifuge tube without touching any surface or other object. One blank wipe is collected for each dwelling unit sampled or, if more than one dwelling unit is sampled per day, one blank for every 50 field samples, whichever is less. Also, collect one blank for every lot used. Record the lot number.

5. Inspector Decontamination:

After sampling, wash hands thoroughly with plenty of soap and water before getting into car. A bathroom in the dwelling unit may be used for this purpose, with the owner's or resident's permission. If there is no running water in the dwelling unit, use wet wipes to clean the hands. During sampling, inspectors must not eat, drink, smoke, or otherwise cause hand to mouth contact.

6. Spike Sample Submission

Samples spiked with a known amount of leaded dust should be inserted into the sample stream randomly by the person conducting field sampling to determine if there is adequate quality control of the digestion process at the laboratory. Dust-spiked wipe samples should be submitted blindly to the laboratory by the individual performing field sampling at the rate of no less than one for every fifty field samples. Any laboratory can spike wipe samples using the procedure in Appendix 14.3. The laboratory performing the analysis of the field samples can also prepare the spike sample as long as the person performing the field sampling makes the spike sample indistinguishable from the field samples. The person conducting the field sampling should take the spike sample prepared in the laboratory and relabel the container with an identifier similar to the other field samples. The spike sample wipe should not be put into another container. Spike samples should be made using the same lot as that used in the field.

A dust-spiked sample is defined as a wipe or filter containing a known weight of lead-based paint dust, measured to the nearest 0.1 µg of leaded dust. A dust-spiked sample is prepared in a laboratory with the amount of lead-based dust present being between 50 - 1000 µg. For wipe

samples, labs should use NIST Standard Lead Paint Dust (Standard 1578) or an equivalent secondary standard. See Appendix 14.3 for further details.

7. Field Qualifications of Dust Sampling Technicians

All individuals performing dust sampling should have state-certified training. Where possible, field experience in environmental sampling is preferable.

8. Quality Assurance/Quality Control

Blind analysis of spiked samples must fall within 80% - 120% of the true value. If the laboratory fails to obtain readings within the QA/QC error limits:

a. Two more spikes should be sent immediately to the lab for analysis.

b. If the two additional spike samples fail, the sample batch should be considered invalid. A full review of laboratory procedures may be necessary. Additional samples may need to be collected from the dwelling units from locations near the locations previously sampled.

If more than 50 µg/wipe is detected in a blank sample, the samples should be collected again since the media is contaminated. Blank correction of wipe samples is not recommended.

9. Other Information

See Chapter 5 and Chapter 14 for additional information on dust wipe sampling. Also see "Residential Sampling for Lead: Protocols for Leaded Dust and Soil Sampling" from EPA and ASTM ES 30-94 for further information.

Appendix 13.2
Paint Chip Sampling

Dust sampling must always be done **before** paint chip sampling in order to minimize the prospect of cross-sample contamination. Paint chip sampling is a destructive method that may release a small quantity of lead dust. Although paint chip samples are to be collected from inconspicuous areas, the occupant must always be notified that paint chip sampling may be necessary.

1. Paint Chip Sampling Tools and Materials

a. Sharp stainless steel paint scraper (such as Proprep™ Scraper, $7.50, 1-800-255-4535) available at many paint stores.

b. Disposable wipes for cleaning paint scraper.

c. Non-sterilized non-powdered disposable gloves.

d. Hard-shelled containers (such as non-sterilized 50-ml polypropylene centrifuge tubes) that can be rinsed quantitatively for paint chip samples if results are to be reported in mg/cm^2. Ziplock baggies can be used only if results are to be reported in µg/g or percent by weight.

e. Collection device (clean creased piece of paper or cleanable tray).

f. Field sampling and laboratory submittal forms.

g. Tape measure or ruler (if results are reported in mg/cm^2).

h. Ladder.

i. Plastic trash bags.

j. Flashlight.

k. Adhesive tape.

l. Heat Gun or other heat source operating below 1100°F to soften the paint before removal.

2. Containment

a. Method One: Plastic Sheeting Underneath Sampling Area

A clean sheet of plastic measuring four feet by four feet should be placed under the area to be sampled to capture any paint chips that are not captured by the collection device or creased piece of paper. Any visible paint chips falling to the plastic should be included in the sample. Dispose of the plastic after each sample is collected by placing the sheeting in a trash bag. Do not throw away the plastic at the dwelling. Wet wipes may be used to clean the area.

b. Method Two: "Glovebag" Approach

If further containment is deemed necessary, a "glovebag" approach may be used. A durable sheet of plastic is loosely taped to the surface to be sampled, with a paint scraper, collection device, and shipment container housed inside the plastic. There should be enough "play" in the plastic to permit a scraping motion without dislodging the tape holding the plastic to the surface. Large plastic baggies can be used in lieu of the sheet of plastic if paint chips are to be shipped to the lab in plastic baggies. Properly conducted, this method completely seals the surface during the actual scraping operation. A four by four foot sheet of plastic is still required under the glove bag to capture any debris that falls to the ground during the glove bag removal. The tape should be slowly removed from the surface to avoid lifting any additional paint off of the surface.

3. Paint Sample Collection

The paint chip sample need not be more than 2-4 square inches in size (consult with the laboratory for the optional size). Persons collecting paint chips should wear new disposable gloves for each sample.

The most common paint sampling method is to scrape paint directly off the substrate. The goal is to remove all layers of paint equally, but none of the substrate. A heat gun should be used to soften the paint before removal to reduce the chances of including substrate with the sample and to help prevent sample loss. Including substrate in the sample will dilute the lead content if results are reported in µg/g or weight percent. Hold the heat gun no closer than six inches from the surface. Do not scorch the paint. Discontinue heating as soon as softening or blistering is observed.

Use a razor-sharp scraper to remove paint from the substrate. Paint samples collected in this fashion are usually reported in µg/g or % lead only. The sample may be placed in a baggie for shipment to the laboratory.

If the area sampled is measured exactly, and all the paint within that area can be removed and collected, it is possible to also report the results in mg/cm². All of the sample must be placed in a hard-shelled container for shipment to the laboratory. The hard-shelled container is used since the laboratory will analyze the entire sample submitted. The exact dimensions of the area sampled must be recorded on the field sampling form. For mg/cm², including a small amount of substrate in the sample is permitted.

4. Composite Paint Chip Sample Collection

Paint chip samples may be composited by collecting individual subsamples from different surfaces. If results are reported in mg/cm², each subsample should be exactly the same size in surface area. If results are reported in weight percent or µg/g, each subsample should have about the same weight (weighing is done in a laboratory). The result is then compared to the standard for lead-based paint divided by the number of sub-samples (the composite standard). If the result is above this number, one or more of the samples may be above the standard. Each sub-sample should be reanalyzed individually in this case. If the result is below this number, none of the sub-samples can contain lead above the standard. No more than 5 subsamples should be included in the same sample container or ziplock baggie. If both single-surface and composite samples

are collected side-by-side, the individual samples can be submitted for analysis without returning to the dwelling if the composite result is above the composite standard. If the laboratory does not analyze the entire composite sample, it must use a validated homogenizing technique to ensure that all sub-samples are completely mixed together.

5. Cleanup and Repair

a. All settled dust generated must be cleaned up using wet wipes.

b. The surface can be resealed with new paint if necessary. If desired, apply spackling and/or new paint to repair the area where paint was removed.

c. Personnel conducting paint sampling should avoid hand-to-mouth contact (specifically, smoking, eating, drinking, and applying cosmetics) and should wash their hands with running water immediately after sampling. The inspector should ask to use the resident's bathroom for this purpose. Wet wipes may be used if no running water is available or if the bathroom is not available.

6. Laboratory Submittal

The samples should be submitted to a laboratory recognized by the EPA National Lead Laboratory Accreditation Program. Appropriate sample submittal forms should be used. The field sample number should appear on the field sampling form, the laboratory submittal form, and the container label. The name of the laboratory, the date the samples were sent to the lab, and all personnel handling the sample from the time of collection to the time of arrival at the laboratory should be recorded on a chain of custody form, if appropriate.

See Appendix 14 for the laboratory analytical procedures to be used.

7. Qualifications of Paint Sampling Technicians

All individuals performing paint sampling should be certified. Where possible, field experience in environmental sampling is preferable.

8. Other Information

See ASTM ES 28-94 and ES 37-94 for additional information

Appendix 13.3: Soil Sampling Protocol For Housing

A. Collection Technique General Description

Bare soil samples are typically collected with a coring device or a scooping technique. The device may be used in either of two ways. Most coring devices come equipped with a "T" handle which can be attached to the top of the coring tool or probe. This allows the operator to push the tool into the ground. The coring tool can be twisted with the "T" handle as it is pushed into the ground in order to allow the cutting edge of the soil probe to cut through roots and packed earth. In softer soils, a disposable new plastic syringe at least ½ inch diameter can be used for each composite sample

The other method for using the coring tool is to attach a hammer device to the top of the coring tool. To utilize the coring tool in this manner, the hammer device is first attached to the top of the coring tool and the tip of the probe is placed on the ground where the sample is to be collected. The hammer is then raised and allowed to fall while it is guided by the operator's hands. The hammer attachment may be the most appropriate tool when the nature of the soils is hard and compacted. Otherwise the "T" handle is easier to use.

The soil samples are collected by driving or pushing the coring tool into the ground, usually about ½ inch deep. The tool is then moved gently from side to side to loosen a plug of soil. The tool is then pulled from the ground and the soil sample is pushed so that the upper part of the soil plug lies between one inch marks made on the coring device. The top one half inch of the soil sample is then cut from the core with a stainless steel knife or cutting tool provided for that purpose. This top one half inch section of the soil core is then transferred to a sample container. All sub-samples are collected in this manner. The collection of subsamples from the sampling line is referred to as a "composite" sample.

After collecting a composite sample, the soil probe should be decontaminated or discarded if disposable core liners are used. This process consists of wiping the end of the probe with wet wipes until no more visible dirt is removed from the probe. Similar cores are then collected from the bottom inch of the six-inch core.

B. Materials and Supplies

1. Core sampling device: Standard soil coring device. Other similar core sampling devices may be used, such as disposable plastic syringes with the end cut off. The plunger is used to remove the soil from the syringe body.

2. Disposable wipes.

3. Non-sterilized 5" x 8" plastic ziplock baggies: Unless baggies are 4 mil industrial strength, they must be double bagged

4. Non-sterilized non-powdered disposable gloves: For example, Action Scientific (800-678-1033) No. A-105

5. Floor Plan & Property Sketch

6. Soil Sample Collection Form

7. Laboratory submittal form

8. Pre-printed labels or permanent ink pen

9. Trash bag or other receptacle (do not use pockets or trash containers at the residence)

C. Bare Soil Sampling Procedures

1. Soil sampling is not recommended when the ground is frozen.

2. The location of soil samples should be recorded on the exterior site plan sketch.

3. Perimeter Sampling Locations: One composite soil sample should be collected so that at least 5 and no more than 10 different aliquots of surface soil are collected from the building perimeter. The aliquots should be collected from all sides of the building where bare soil is present. Each spot should be at least 2 feet distant from each other and 2 feet away from the foundation, unless the bare soil is closer than 2 feet.

4. Play Area Sampling Locations: A second composite sample should consist of at least 5 and no more than 10 aliquots collected along an X-shaped grid in the child's principle play area. Each spot should be at least 1 foot distant from each other. The soil where the aliquots are collected must be bare.

5. The core sampling device should be used to deliver the top ½ inch of soil from each spot to the baggie. No special effort should be made to collect visible paint chips. If paint chips are present, they should not be avoided and should be included in the sample. When sampling play areas, the inspector should make an effort to avoid including grass, twigs, stones, and other gross debris in the sample.

6. When all aliquots of the composite sample have been placed in the baggie, the baggie should be ziplocked. If the baggie is not 4 mil industrial weight, the sample should be double bagged. A label with the sample number should be affixed to the baggie. The number should be recorded on the soil plat form showing the approximate location of each sample and the soil collection field data form.

7. The core sampler should be cleaned with a disposable wipe after each composite sample is collected. If a disposable core sampler is used, it can be used for all sub-samples, but not new composite samples unless it is cleaned thoroughly.

D. Laboratory Submittal

1. Submittal Form Preparation

   The sample numbers on the sample container must be the same as those on the field sampling form and must also be used on the laboratory submittal form. Confirm that all samples recorded on are in fact present on the laboratory submittal form.

   Chain of custody requirements should be followed if applicable.

E. Laboratory Analytical Procedure

1. Laboratories analyzing soil samples must participate in the Environmental Lead Laboratory Proficiency Testing Program or equivalent and be an EPA-NLLAP Accredited Laboratory.

2. Soil samples are received, logged in, opened and placed on drying plates, dried, and mixed thoroughly.

3. Sample sieving: Samples are to be sieved once with a number 10 sieve with a mesh size of 2 millimeters. Visible paint chips are disaggregated by forcing the paint chips and other large particles through the sieve by a rubbing motion. Sieving is always done under a laboratory hood.

4. Samples are oven dried to a constant weight and analyzed by EPA Method SW-846 or equivalent.

F. See ASTM ES 29-94 for further information.

Appendix 13.4: Sampling Airborne Particulate for Lead (NIOSH Method 7082)

Editor's Note: See also ASTM Standard E 1553-93 and ES 33-94

LEAD

Formula: Pb
M.W.: 207.19 (Pb); 223.19 (PbO)

METHOD: 7082
ISSUED: 2/15/84

OSHA: 0.05 mg/m^3
NIOSH: 0.05 mg/m^3 [1]
ACGIH: 0.15 mg/m^3; STEL 0.45 mg/m^3

PROPERTIES: soft metal; d 11.3 g/cm^3; MP 327.5°C; valences +2, +4 in salts

SYNONYMS: vary depending on the chemical form (elemental lead and lead compounds except alkyl lead); CAS #1317-36-8 (PbO); CAS #7439-92-1 (Pb). Editor's Note: This method has not been validated for lead paint chip samples. It is typically used to analyze lead air samples.

SAMPLING

SAMPLE: FILTER
(0.8 µm cellulose ester membrane)

FLOW RATE: 1 to 4 L/min

VOL-MIN: 200 L@ 0.05 mg/m³
-MAX: 1200L

SHIPMENT: routine

SAMPLE STABILITY: stable

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIES: 0.13 to 0.4 mg/m³ [2]; 0.15 to 1.7 mg/m³ (fume) [3]

BIAS: not significant [2]
OVERALL PRECISION (s_r): 0.072 [2]; 0.068 (fume) [3]

MEASUREMENT

TECHNIQUE: ATOMIC ABSORPTION, FLAME

ANALYTE: lead

ASHING: conc. HNO_3, 6 ml; 140° C

FINAL SOLUTION: 10% HNO_3, 10 ml

FLAME: air-acetylene, oxidizing

WAVELENGTH: 283.3 nm

BACKGROUND CORRECTION: D_2 or H_2 lamp

CALIBRATION: Pb++ in 10% HNO_3

RANGE: 10 to 200 µg per sample [3, 8]

ESTIMATED LOD: 2.6 µg per sample [9]

PRECISION (s_r): 0.03 [2]

APPLICABILITY: The working range is 0.025 to 0.5 mg/m^3 for a 400 L air sample. The method is applicable to elemental lead, including Pb fume, and all other aerosols containing lead. This is an elemental analysis, not compound specific. Aliquots of the samples can be analyzed separately for additional elements.

INTERFERENCES: Use D_2 or H_2 continuum background correction to control flame or molecular absorption. High concentrations of calcium, sulfate, carbonate, phosphate, iodide, fluoride, or acetate can be corrected.

OTHER METHODS: This method combines and replaces P&CAM 173 [8] and S341 [7,9] for lead. Method 7300 (ICP-AES) is an alternate analytical method. Method 7505 is specific for lead sulfide. The following have not been revised: the dithizone method, which appears in P&CAM 102 [4] and the lead criteria document [1]; P&CAM 191 (ASV) [5]; and P&CAM 214 (graphite furnace-AAS) [6].

REAGENTS:

1. Nitric acid, conc.
2. Nitric acid, 10% (w/v). Add 100 ml conc. HNO_3 to 500 ml water; dilute to 1 l.
3. Hydrogen peroxide, 30% H_2O_2 (w/w), reagent grade.
4. Calibration stock solution, 1000 µg Pb/ml. Commercial standard or dissolve 1.00 g Pb metal in minimum volume of (1+1) HCl and dilute to 1 l with 1% (v/v) HCl. Store in a polyethylene bottle. Stable ≥ one year.
5. Air compressed, filtered.
6. Acetylene.
7. Distilled or deionized water.

EQUIPMENT:

1. Sampler: Cellulose ester filter, 0.8 µm pore size, 37 mm diameter; in cassette filter holder.
2. Personal sampling pump, 1 to 4 l/min, with flexible connecting tubing.
3. Atomic Absorption Spectrophotometer with an air-acetylene burner head.
4. Lead hollow cathode lamp or electrode dischargeless lamp.
5. Regulators, two-stage, for air and acetylene.
6. Beakers, Phillips, 125 ml, or Griffin, 50 ml with watchglass covers.*
7. Volumetric flasks, 10 and 100 ml.*
8. Assorted volumetric pipets as needed.*

REAGENTS:

EQUIPMENT:

9. Hotplate, surface temperature 140°C.

10. Bottles, polyethylene, 100 ml.

* Clean all glassware with conc. nitric acid and rinse thoroughly with distilled or deionized water before use.

SPECIAL PRECAUTIONS: Perform all acid digestions in a fume hood.

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.

2. Sample at an accurately known flow rate between 1 and 4 l/min for up to 8 hrs for TWA measurements.[1] Do not exceed a filter loading of ca. 2 mg total dust.

SAMPLE PREPARATION:

NOTE: The following sample preparation gave quantitative recovery (see EVALUATION OF METHOD) [9]. Steps 4 through 9 of Method 7300 or other quantitative ashing techniques may be substituted, especially if several metals are to be determined on a single filter.

3. Open the cassette filter holders and transfer the samples and blanks to clean beakers.

4. Add 3 ml conc. HNO_3, and 1 ml 30% H_2O_2 and cover with a watchglass. Start reagent blanks at this step.

NOTE: If PbO_2 is not present in the sample, the 30% H_2O_2 need not be added [3,9].

5. Heat on hotplate (140°C) until most of the acid has evaporated.

6. Repeat two more times using 2 ml conc. HNO_3 and 1 ml 30% H_2O_2 each time.

7. Heat on 140°C hotplate until a white ash appears.

8. When sample is dry, rinse the watchglass and walls of the beaker with 3 to 5 ml 10% HNO_3. Allow the solution to evaporate to dryness.

9. Cool each beaker and dissolve the residues in 1 ml conc. HNO_3.

[1] Editor's Note: Use a flow rate of 2 liters/minute and a closed-face 37 mm cassette.

10. Transfer the solution quantitatively to a 10 ml volumetric flask and dilute to volume with distilled water.

NOTE: If the concentration (M) of any of the following is expected to exceed the lead concentration (M) by 10 fold or more, add 1 ml 1 M Na_2EDTA to each flask before dilution to volume: CO, PO_3, I^-, F^-, $CH_3COO^=$. If Ca^{++} or SO are present in 10-fold excess, make all standards and samples 1% (w/w) in La^{++} [8].

CALIBRATION AND QUALITY CONTROL:

11. Prepare a series of working standards covering the range 1 to 20 µg Pb/ml (1 to 200 µg Pb per sample) by adding aliquots of calibration stock solution to 100 ml volumetric flasks. Dilute to volume with 10% HNO_3. Store the working standards in polyethylene bottles and prepare fresh weekly.

12. Analyze the working standards together with the blanks and samples (steps 17 and 18).

13. Prepare a calibration graph of absorbance vs. solution concentration (µg/ml).

14. Aspirate a standard for every 10 samples to check for instrument drift.

15. Check recoveries with at least one spiked media blank per 10 samples.

16. Use method of additions occasionally to check for interferences.

MEASUREMENT:

17. Set spectrophotometer as specified by the manufacturer and to conditions on page 13.6-1.

NOTE: An alternative wavelength is 217.0 nm [10]. Analyses at 217.0 nm have slightly greater sensitivity, but poorer signal-to-noise ratio compared to 283.3 nm. Also, non-atomic absorption is significantly greater at 217.0 nm, making the use of D_2 or H_2 continuum correction mandatory at that wavelength.

18. Aspirate standards, samples and blanks. Record absorbance readings.

NOTE: If the absorbance values for the samples are above the linear range of the standards, dilute with 10% HNO_3, reanalyze and apply the appropriate dilution factor in the calculations.

CALCULATIONS:

19. Using the measured absorbances, calculate the corresponding concentrations (µg/ml) of lead in the sample, C_s, and average media blank, C_b, from the calibration graph.

20. Using the solution volumes (ml) of the sample, V_s, and media blanks, V_b, calculate the concentration, C (mg/m_3), of lead in the air volume sampled, V (L):

$$C = \frac{C_s V_s - C_b V_b}{V}, \ mg/m^3$$

EVALUATION OF METHOD:

Method S241 [7] was issued on October 24, 1975, and validated over the range 0.13 to 0.4 mg/m^3 for a 180 l air sample, using generated atmospheres of lead nitrate [2]. Recovery in the range 18 to 72 µg Pb per sample was 98%, and collection efficiency of 0.8 µm mixed cellulose ester filters (Millipore Type AA) was 100% for the aerosols. Subsequent studies on analytical recovery of 200 µg Pb per sample gave the results [3,9]:

Species	Digestion Method	Analytical Recovery, %
Pb metal	HNO_3 only	92 ± 4
Pb metal	HNO_3 + H_2O_2	103 ± 3
PbO	HNO_3 only	93 ± 4
PbS	HNO_3 only	93 ± 5
PbO_2	HNO_3 only	82 ± 3
PbO_2	HNO_3 + H_2O_2	100 ± 1
Pb in paint*	HNO_3 only	95 ± 6
Pb in paint*	HNO_3 + H_2O_2	95 ± 6

* Standard Reference Material #1579, U.S. National Bureau of Standards.

Additional collection efficiency studies were also done using Gelman GN-4 filters for the collection of Pb fume, which had geometric mean diameter of 0.1 µm [3]. Mean collection efficiency for 24 sampling runs at flow rates between 0.15 and 4.0 l/min was > 97 ± 2%. Overall precision, s_r, was 0.072 for lead nitrate aerosol [2,7] and 0.068 for Pb fume [3,9].

REFERENCES:

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[2] Documentation of the NIOSH Validation Tests, U.S. Department of Health, Education and Welfare, Publ. (NIOSH) 77-185 (1977).

[3] Heavy Metal Aerosols: Collection and Dissolution Efficiencies, Final Report of NIOSH Contract 210-79-0058, W.F. Gutknecht, M.H. Ranade, P.M. Grohse, A. Damle, and D. O'Neal, Research Triangle Institute; available as Order No. PB 83-106740 from NTIS, Springfield, VA 22161 (1981).

[4] NIOSH Manual of Analytical Methods, 2nd ed., V. 1, P&CAM 102, U.S. Department of Health, Education and Welfare, Publ. (NIOSH) 77-157-A (1977).

[5] Ibid, P&CAM 191.

[6] Ibid, P&CAM 214.

[7] Ibid, V. 3, S341, U.S. Department of Health, Education and Welfare, Publ. (NIOSH) 77-157-C (1977).

[8] Ibid, V. 5, P&CAM 173, U.S. Department of Health, Education and Welfare, Publ. (NIOSH) 77-157-A (1979).

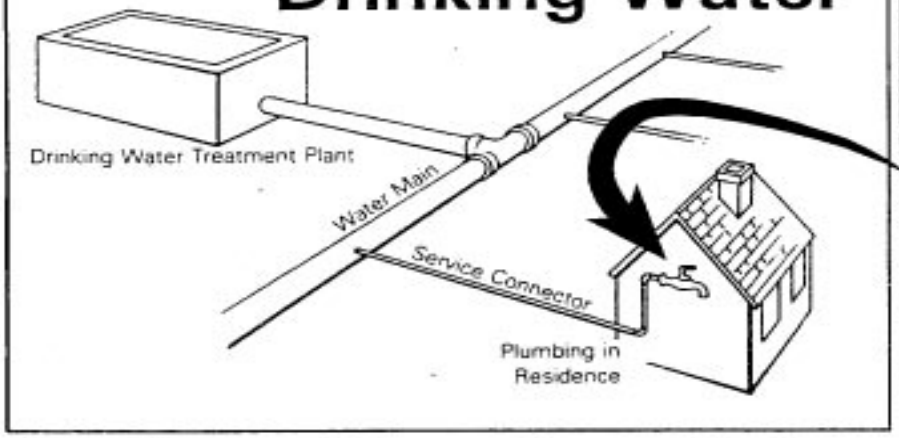
[9] Ibid, V. 7, (revised 3/25/81), U.S. Department of Health, Education and Welfare, Publ. (NIOSH) 82-100 (1982).

[10] Analytical Methods for Atomic Absorption Spectrophotometry, Perkin-Elmer (1976).

METHOD REVISED BY: Mark Millson and R. DeLon Hull, NIOSH/DPSE; S341 originally validated under NIOSH Contract CDC-94-74-45; additional studies under NIOSH Contract 210-79-0058.

United States Environmental Protection Agency
Office of Water (WH-550)
EPA/810-F-93-001
June 1993

LEAD In Your Drinking Water



Health Threats From Lead

Too much lead in the human body can cause serious damage to the brain, kidneys, nervous system, and red blood cells.

You have the greatest risk, even with short-term exposure, if:

- you are a young child, or
- you are pregnant.

Sources of Lead in Drinking Water

Lead levels in your drinking water are likely to be highest if:

- your home has faucets or fittings made of brass which contains some lead, **or**
- your home or water system has lead pipes, **or**
- your home has copper pipes with lead solder, **and**
  - the home is less than five years old, or
  - you have natually soft water, or
  - water often sits in the pipes for several hours.

Actions You Can Take To Reduce Lead In Drinking Water

Flush Your Pipes Before Drinking

Anytime the water in a particular faucet has not been used for six hours or longer, "flush" your cold-water pipes by running the water until it becomes as cold as it will get. (This could take as little as five to thirty seconds if there has been recent heavy water use such as showering or toilet flushing. Otherwise, it could take two minutes or longer.) The more time water has been sitting in your home's pipes, the more lead it may contain.

Only Use Cold Water for Consumption

Use *only* water from the cold-water tap for drinking, cooking, and **especially for making baby formula**. Hot water is likely to contain higher levels of lead.

The two actions recommended above are very important to the health of your family. They will probably be effective in reducing lead levels because most of the lead in household water usually comes from the plumbing in your house, not from the local water supply.

Have Your Water Tested

After you have taken the two precautions above for reducing the lead in water used for drinking or cooking, **have your water tested.** The only way to be sure of the amount of lead in your household water is to have it tested by a competent laboratory. Your water supplier may be able to offer information or assistance with testing. Testing is especially important for apartment dwellers, because flushing may not be effective in high-rise buildings with lead-soldered central piping.

For more details on the problem of lead in drinking water and what you can do about it, read the following questions and answers.
Your local or state department of health or environment might be able to provide additional information.

Q Why is lead a problem?

A Although it has been used in numerous consumer products, lead is a toxic metal now know to be harmful to human health if inhaled or ingested. Important sources of lead exposure include: ambient air, soil, and dust (both inside and outside the home), food (which can be contaminated by lead in the air or in food containers), and water (from the corrosion of plumbing). On average, it is estimated that lead in drinking water contributes between 10 and 20 percent of total lead exposure in young children. In the last few years, federal controls on lead in gasoline have significantly reduced people's exposure to lead.

The degree of harm depends upon the level of exposure (from all sources). Known effects of exposure to lead range from subtle biochemical changes at low levels of exposure, to severe neurological and toxic effects or even death at extremely high levels.

Q Does lead affect everyone equally?

A Young children, infants and fetuses appear to be particularly vulnerable to lead poisoning. A dose of lead that would have little effect on an adult can have a big effect on a small body. Also, growing children will more rapidly absorb any lead they consume. A child's mental and physical development can be irreversibly stunted by over-exposure to lead. In infants, whose diet consists of liquids made with water - such as baby formula - lead in drinking water makes up an even greater proportion of total lead exposure (40 to 60 percent).

Q How could lead get into my drinking water?

A Typically, lead gets into your water after the water leaves your local treatment plant or your well. That is, the source of lead in your home's water is most likely pipe or solder in your home's own plumbing.

The most common cause is corrosion, a reaction between the water and the lead pipes or solder. Dissolved oxygen, low pH (acidity) and low mineral content in water are common causes of corrosion. All kinds of water, however, may have high levels of lead.

One factor that increases corrosion is the practice of grounding electrical equipment (such as telephones) to water pipes. Any electric current traveling through the ground wire will accelerate the corrosion of lead in the pipes. (Nevertheless, wires **should not be removed** from pipes unless a qualified electrician installs an adequate alternative grounding system.)

Q Does my home's age make a difference?

A Lead-contaminated drinking water is most often a problem in houses that are either very old or very new.

Up through the early 1900's, it was common practice, in some areas of the country, to use lead pipes for interior plumbing. Also, lead piping was often used for the service connections that join residences to public water supplies. (This practice ended only recently in some localities.) Plumbing installed before 1930 is most likely to contain lead.

Copper pipes have replaced lead pipes in most residential plumbing. However, the use of lead solder with copper pipes is widespread. Experts regard this lead solder as the major cause of lead contamination of household water in U.S. homes today. New brass faucets and fittings can also leach lead, even though they are “lead-free”.

Scientific data indicate that the newer the home, the greater the risk of lead contamination. Lead levels decrease as a building ages. This is because, as time passes, mineral deposits form a coating on the inside of the pipes (if the water is not corrosive). This coating insulates the water from the solder. But, during the first five years (before the coating forms) water is in direct contact with the lead. More likely than not, **water in buildings less than five years old has high levels of lead contamination**.

Q How can I tell if my water contains too much lead?

A You should have your water tested for lead. Testing costs between $20 and $100. Since you cannot see, taste, or smell lead dissolved in water, testing is the only sure way of telling whether or not there are harmful quantities of lead in your drinking water.

You should be particularly suspicious if your home has lead pipes (lead is a dull gray metal that is soft enough to be easily scratched with a house key), if you see signs of corrosion (frequent leaks, rust-colored water, stained dishes or laundry), or if your non-plastic plumbing is less than five years old. You water supplier may have useful information, including whether or not the service connector used in your home or area is made of lead.

Testing is especially important in high-rise buildings where flushing might not work.

Q How do I have my water tested?

A Water samples from the tap will have to be collected and sent to a qualified laboratory for analysis. Contact your local water utility or your local health department for information and assistance. In some instances, these authorities will test your tap water for you, or they can refer you to a qualified laboratory. You may find a qualified testing company under “Laboratories” in the yellow pages of your telephone directory.

You should be sure that the lab you use has been approved by your state or by EPA as being able to analyze drinking water samples for lead contamination. To find out which labs are qualified, contact your state or local department of the environment or health.

Q What are the testing procedures?

A Arrangements for sample collection will vary. A few laboratories will send a trained technician to take the samples; but in most cases, the lab will provide sample containers along with instructions as to how you should draw your own tap-water samples. If you collect the samples yourself, make sure you follow the lab's instructions exactly. Otherwise, the results might not be reliable.

Make sure that the laboratory is following EPA's water sampling and analysis procedures. Be certain to take a “first draw” and a “fully flushed” sample. (The first-draw sample - taken after at least six hours of no water use from the tap tested - will have the highest level of lead, while the fully

flushed sample will indicate the effectiveness of flushing the tap before using the water.)

Q How much lead is too much?

A Federal standards initially limited the amount of lead in water to 50 parts per billion (ppb). In light of new health and exposure data, EPA has set an action level of 15 ppb. If tests show that the level of lead in your household water is in the area of 15 ppb or higher, it is advisable - especially if there are young children in the home - to reduce the lead level in your tap water as much as possible. (EPA estimates that more than 40 million U.S. residents use water that can contain lead in excess of 15 ppb.)

Note: One ppb is equal to 1.0 microgram per liter (ug/l) or 0.001

milligram per liter (mg/l).

Q How can I reduce my exposure?

A If your drinking water is contaminated with lead - or until you find out for sure - there are several things you can do to minimize your exposure. Two of these actions should be taken right away by everyone who has, or suspects, a problem. The advisability of other actions listed here will depend upon your particular circumstances.

Immediate Steps

- The first step is to refrain from consuming water that has been in contact with your home's plumbing for more than six hours, such as overnight or during your work day. Before using water for drinking or cooking, “flush” the cold water faucet by allowing the water to run until you can feel that the water has become as cold as it will get. You must do this for each drinking water faucet - taking a shower will not flush your kitchen tap. Buildings built prior to about 1930 may have service connectors made of lead. Letting the water run for an extra 15 seconds after it cools should also flush this service connector. Flushing is important because the longer water is exposed to lead pipes or lead solder, the greater the possible lead contamination. (The water that comes out after flushing will not have been in extended contact with lead pipes or solder.) Once you have flushed a tap, you might fill one or more bottles with water and put them in the refrigerator for later use that day. (The water that was flushed - usually one to two gallons - can be used for non-consumption purposes such as washing dishes or clothes; it needn't be wasted.)

Note: Flushing may prove ineffective in high-rise buildings that have large-diameter supply pipes joined with lead solder.

- The second step is to never cook with or consume water from the hot-water tap. Hot water dissolves more lead more quickly than cold water. So, do not use water taken from the hot tap for cooking or drinking, and **especially not for making baby formula**. (If you need hot water, draw water from the cold tap and heat it on the stove.) Use only thoroughly flushed water from the cold tap for any consumption.

Definitions

Corrosion: A dissolving and wearing away of metal caused by a chemical reaction (in this case, between water and metal pipes, or between two different metals).

First Draw: The water that immediately comes out when a tap is first opened.

Flush: To open a cold-water tap to clear out all the water which may have been sitting for a long time in the pipes. In new home, to flush a system means to send large volumes of water gushing through the unused pipes to remove loose particles of solder and flux. (Sometimes this is not done correctly or at all.)

Flux: A substance applied during soldering to facilitate the flow of solder. Flux often contains lead and ca, itself, be a source of contamination.

Naturally soft water: Any water with low mineral content, lacking the hardness minerals calcium and magnesium.

Public Water System: Any system that supplies water to 25 or more people or has 15 or more service connections (buildings or customers).

Service Connector: The pipe that carries tap water from the public water main to a building. In the past these were often made of lead.

Soft water: Any water that is not “hard” Water is considered to be hard when it contains a large amount of dissolved minerals, such as salts containing calcium or magnesium. You may be familiar with hard water that interferes with the lathering action of soap.

Solder: A metallic compound used to seal joints in plumbing. Until recently, most solder contained about 50 percent lead.

Other Actions

- If you are served by a public water system (more than 219 million people are) contact your supplier and ask whether or not the supply system contains lead piping, and whether your water is corrosive. If either answer is yes, ask what steps the supplier is taking to deal with the problem of lead contamination.

Drinking water can be treated at the plant to make it less corrosive. Cities such as Boston and Seattle have successfully done this for an annual cost of less than one dollar per person. (Treatment to reduce corrosion will also save you and the water supplier money by reducing damage to plumbing.)

Water mains containing lead pipes can be replaced, as well as those portions of lead service connections that are under the jurisdiction of the supplier.

- If you own a well or another water source, you can treat the water to make it less corrosive. Corrosion control devices for individual households include calcite filters and other devices. Calcite filters should be installed in the line between the water source and any lead service connections or lead-soldered pipe. You might ask your health or water department for assistance in finding these commercially available products.

- Recently a number of cartridge type filtering devices became available on the market. These devices use various types of filtering media, including carbon, ion exchange resins, activated alumina and other privately marketed products. Unless they have been certified as described below, the effectiveness of these devices to reduce lead exposure at the tap can vary greatly. It is highly recommended that before purchasing a filter, you verify the claims made by the vendor. If you have bought a filter, you should replace the filter periodically as specified by the manufacturer. Failure to do so may result in exposure to high lead levels.

Two organizations can help you decide which type of filter is best for you. The National Sanitation Foundation, International (NSF), an independent testing agency, evaluates and certifies the performance of filtering devices to remove lead from drinking water. Generally, their seal of approval appears on the device and product packaging. The Water Quality Association (WQA) is an independent, not-for-profit organization that represents firms and individuals who produce and sell equipment and services which improves the quality of drinking water. WQA's water quality specialists can provide advice on treatment units for specific uses at home or business.

For additional information regarding the certification program, contact NSF at (313) 769-8010, or WQA at (708) 505-0161, ext. 270.

- You can purchase bottled water for home and office consumption. (Bottled water sold in interstate commerce is regulated by the Food and Drug Administration. Water that is bottled and sold within a state is under state regulation. EPA does not regulate bottled water.)

- When repairing or installing new plumbing in old homes, instruct, in writing, any plumber you hire to use only lead-free materials.

- When building a new home, be sure lead-free materials are used. Before you move into a newly built home, remove all strainers from faucets and flush the water for at least 15 minutes to remove loose solder or flux debris from the plumbing. Occasionally, check the strainers and remove any later accumulation of loose solder or flux debris from the plumbing. Occasionally, check the strainers and remove any later accumulation of loose material.

Q What about lead in sources other than drinking water?

A As mentioned above, drinking water is estimated to contribute only 10 to 20 percent of the total lead exposure in young children. Ask your local health department or call EPA for more information on other sources of exposure to lead. A few general precautions can help prevent contact with lead in and around your home:

❖ Avoid removing paint in the home unless you are sure it contains no lead. Lead paint should only be removed by someone who knows how to protect you from lead paint dust. However, by washing floors, window sills, carpets, upholstery and any objects children put in their mouths, you can get rid of this source of lead.

❖ Make sure children wash their hands after playing outside in the dirt or snow.

❖ Never store food in open cans. Keep it in glass plastic or stainless steel containers. Use glazed pottery only for display if you don't know whether it contains lead.

❖ If you work around lead, don't bring it home. Shower and change clothes at work and wash your work clothes separately.

Q Aren't there a lot of types of treatment devices that would work?

A There are many devices which are certified for effective lead reduction, but devices that are not designed to remove lead will not work. It is suggested that you follow the recommendations below before purchasing any device:

- Avoid being misled by false claims and scare tactics. Be wary of "free" water testing that is provided by the salesperson to determine your water quality; many tests are inaccurate or misleading. Research the reputation and legitimacy of the company or sales representative.

- Avoid signing contracts or binding agreements for “one-time” offers or for those that place a lien on your home. Be very careful about giving credit card information over the phone. Check into any offers that involve prizes or sweepstakes winnings.

- As suggested above, verify the claims of manufacturers by contacting the National Sanitation Foundation International or the Water Quality Association.

Q What is the government doing about the problem of lead in household water?

A There are two major governmental actions to reduce your exposure to lead:

- Under the authority of the Safe Drinking Water Act, EPA set the action level for lead in drinking water at 15 ppb. This means utilities must ensure that water from the customer's tap does not exceed this level in at least 90 percent of the homes sampled. If water from the tap does exceed this limit, then the utility must take certain steps to correct the problem. Utilities must also notify citizens of all violations of the standard.

- In June 1986, President Reagan signed amendments to the Safe Drinking Water Act. These amendments require the use of “lead-free” pipe, solder, and flux in the installation or repair of any public water system, or any plumbing in a residential or non-residential facility connected to a public water system.

Under the provisions of these amendments, solders and flux will be considered “lead-free” when they contain not more than 0.2 percent lead. (In the past, solder normally contained about 50 percent lead.) Pipes and fittings will be considered “lead free” when they contain not more than 8.0 percent lead.

These requirements went into effect in June 1986. The law gave state governments until June 1988 to implement and enforce these new limitations. Although the states have banned all use of lead materials in drinking water systems, such bans do not eliminate lead contamination within existing plumbing. Also, in enforcing the ban, some states have continued to find illegally used lead solder in new plumbing installations. While responsible plumbers always observe the ban, this suggests that some plumbing installations or repairs using lead solder may be escaping detection by the limited number of enforcement personnel.

Where can I get more information?

First contact your county or state department of health or environment for information on local water quality.

For more general information on lead, there are now two toll-free telephone services:

EPA Safe Drinking Water Hotline

1-800-426-4791

National Lead Information Center

1-800-LEAD-FYI

Appendix 14.1: Laboratory Analytical Procedures

Methods used for analysis of samples for lead should be the methods used by the EPA Recognized Laboratory to analyze Environmental Lead Proficiency Analytical Testing (ELPAT) Program samples. ELPAT samples are distributed by the American Industrial Hygiene Association (703-849-8888). These methods are part of the laboratory accreditation process, and are standard operating procedures for analysis of samples.

Further information is available from the EPA Document Residential Sampling for Lead: Protocols for Lead Dust and Soil Sampling. Also see ASTM ES 36-94, ASTM ES 37-94, and ES 35-94

The following are methods which can potentially be used to analyze some types of lead samples. None of the methods listed below have been developed to analyze paint chips specifically. It is the laboratory's responsibility to demonstrate the use of any specific technique or reference materials of the same matrix and mass range of the samples being submitted for analysis. Only laboratories accredited through EPA's National Lead Laboratory Accreditation program should be used.

1. Standard Operating Procedures for Lead in Paint by Hotplate- or Microwave-Based Acid Digestions and Atomic Absorption or Inductively Coupled Plasma Emission Spectrometry, September 1991, NTIS Publication PB92-114172 (EPA 600/8-91/231)

2. NIOSH Methods 7082 and 7300 (NIOSH Manual of Analytical Methods, Third Edition, 1984, Revised 8/15/90, DHHS SN-917-011-00000-1)

3. EPA Methods 200.7, 200.8, 200.9 and 239.2 (Methods for the Chemical Analysis of Water and Wastes, March 1983, NTIS Publication PB84-128677 and Methods for the Determination of Metals in Environmental Samples, June 1991, NTIS Publication 91-231498)

4. EPA Methods 6010, 6020, 7420 and 7421 (Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA SW-846, Third Edition, revised November 1986, EPA Publications PB88-239223 and PB89-148076)

5. Standard Method 3500-Pb (Standard Methods for the Examination of Water and Wastewater, 17th Edition, 1989, APHA/AWWA/WPCF/American Public Health Association)

6. ASTM Methods D3335 and D3618 (Annual Book of ASTM Standards, American Society of Testing and Materials, Philadelphia, PA published annually)

7. EPA Reference Method for the Determination of Lead in Suspended Particulate Matter Collected from Ambient Air (40 CFR Part 50, Appendix G)

8. EPA Method 3015, Microwave Assisted Acid Digestion of Aqueous Samples and Extracts

9. EPA Method 3051, Microwave Assisted Digestion of Sediments, Sludges, Soils, and Oils

10. EPA Method 3050, Acid Digestion of Sediments, Sludges, and Soils

The EPA Office of Pollution Prevention and Toxics has established and oversees the National Lead Laboratory Accreditation Program.

The EPA recognizes a laboratory accrediting organization for the National Lead Laboratory Accreditation Program based on the requirements and conditions set forth in a memorandum of understanding on collaboration between the organization and the National Lead Laboratory Accreditation Program. Laboratories accredited by the organization for the National Lead Laboratory Accreditation Program are recognized by EPA as capable of analyzing lead in dry paint, dust, or soil samples during the period of their accreditation.

A list of recognized laboratories is available from:

1. EPA Lead Hotline: 1-800-424-LEAD

2. National Institute for Occupational Safety and Health (NIOSH)
   1-800-35-NIOSH

Lists of recognized laboratories are also available from the accrediting organizations. Organizations currently offering recognized laboratory accreditation programs are:

· American Association for Laboratory Accreditation (A2LA)
  656 Quince Orchard Road #300
  Gaithersburg, MD 20878
  (301) 670-1377

· American Industrial Hygiene Association (AIHA)
  2700 Prosperity Ave., Suite 250
  Fairfax, VA 22031
  (703) 849-8888

Additional organizations may be added at a later date.

All NLLAP accredited laboratories must participate successfully int he Environmental Lead Proficiency Analytical Testing (ELPAT) program, administered by the American Industrial Hygiene Association under a cooperative research and development agreement with the National Institute for Occupational Safety and Health.

Appendix 14.2: Procedure for the Digestion of Wipe Samples Using Diaper Wipes

Note: Other digestion methods may also produce suitable recovery rates (80%-120% of the "true value" for spiked wipe samples using a known amount of leaded dust).

I. Digestion of Single Surface Samples

Remove and unfold the wipe from the shipment container. Cut the wipe into small pieces and place in a 125 ml Phillips beaker. Quantitatively rinse the shipment container into the Phillips beaker. Cover the wipe with 10 ml of distilled water. Add 2 ml of concentrated HNO_3 and 2 ml of HCl. Gently heat for 20-30 minutes under reflux. Cool and transfer both the liquid and the bulk material left to a 50 ml volumetric flask. If there is too much bulk material left over, rinse with distilled water and squeeze with a glass rod. Add distilled water to make up to final volume. Prior to analysis by AA or ICP, an aliquot is filtered through ashless filter paper, then centrifuged at 9K rpm for 20 minutes. The supernatant liquid is drawn off and analyzed by AA, ICP, or other equivalent method.

II. Digestion of Composite Wipe Samples

The following method can be used to analyze composite dust wipe samples for lead when no more than four single surface samples are combined into a single surface composite sample (i.e., each sample container holds no more than four wipes).

The four wipe samples from each container are cut into smaller pieces and placed into a 250 ml Phillips beaker. Following the addition of 40 mL water, 8 mL concentrated HNO_3, and 8 mL concentrated HCl, the entire sample is refluxed at approximately 100°C for 50 minutes. Upon cooling, the contents in the flask are transferred quantitatively into a 100 mL volumetric flask and brought up to volume using distilled water. To ensure quantitative transfer, the wipes should be squeezed using a glass rod. Prior to analysis, an anliquot is filtered through ashless filter paper, then centrifuged at 9k rpm for 20 minutes. The supernatant liquid is drawn off and analyzed by AA, ICP, or other equivalent method.

Appendix 14.3: Procedure for the Preparation of Field Spiked Wipe Samples

There is currently no analytical grade wipe media suitable for wipe sampling in residences. A variety of commercial media are being used instead (see Appendix 13.1). Because laboratory accreditation programs do not currently provide spiked wipe samples using wipe sampling media commonly used in the field, it is necessary to prepare spiked wipe samples using the specific brand of wet wipes that will actually be used in order to determine if the laboratory digestion procedure is capable of achieving recovery rates between 80 - 120% for the specific brand of diaper wipe used in the field. Some reports indicate that recovery rates can be as low as 40% using certain types of wipes.

These field spiked samples are in addition to those the laboratory prepares for its own internal QA/QC program. The samples are not actually prepared in the field, but are manufactured under laboratory conditions. They are then relabelled in the field and inserted into the sample stream in a random and blind fashion. The spikes should be prepared using the same lot as that used in the field, since recoveries can vary by lot. The lot should be analyzed before use to ensure that there is not background contamination.

The following procedure may be used to prepare spiked wipe samples.

1. Obtain a Standard Reference Material containing a certified concentration of lead, such as NIST Standard 1579a (Powdered Lead-Based Paint) or Standard 1648 (Urban Particulate), or a traceable secondary standard with a known amount of lead.

2. Weigh out between 50 - 500 µg of lead (not total dust) to the nearest microgram.

3. Don a new disposable glove to handle each new wipe sample.

4. If tared weighing boats are used, quantitatively transfer all of the material from the boat to the wipe by wiping the boat thoroughly.

5. If glassine paper is used, be certain that the dust transfer was complete.

6. Do not let the wipe touch any other surface. Fold the wipe with the spiked side inward and carefully insert it into a non-sterilized 50 ml centrifuge tube or other hard-shelled container that is identical to the containers that will hold the field samples. The containers holding the spiked samples should be indistinguishable from those holding the field samples so that the analysis can be performed blindly. This means the same container or tube should be used to hold field samples and wipe samples.

7. Have the spiked sample inserted into the sample stream randomly, with at least one spiked sample for each 50 field samples analyzed and one blank for each sample batch.

OSHA INTERIM FINAL LEAD IN CONSTRUCTION STANDARD

FACT SHEET

The OSHA Interim Final Lead in Construction Standard (1926.62) went into effect June 3, 1993. It applies to all workers doing construction work who may be exposed to lead on the job.

OSHA has developed a compliance document that will clarify the standard. You can order the compliance document by using the OSHA order form. Contact your state or regional OSHA office for an interpretation of the Construction Standard if necessary. (See the Resources Section for a listing.)

The sections of the standard which apply to the different parts of this fact sheet are listed in parentheses ().

1. Airborne lead exposure

How much lead am I allowed to breathe?

There are 2 legal limits for the amount of lead you are allowed to breathe:

Action Level—If you work in an area at or above 30 micrograms per cubic meter of air, your employer must give you medical surveillance and training in the hazards of working with lead. The limit of 30 ug/m^3 is called the Action Level (AL).

Permissible Exposure Limit—Your employer is not allowed to let you breathe in more than 50 micrograms of lead per cubic meter of air. This limit is for the average amount of lead in the air over an 8-hour day. It is called the Permissible Exposure Limit (PEL). If you work in an area with more lead in the air than the PEL, your employer must reduce your exposure.

If you are exposed to lead for more than 8 hours a day, the PEL must be adjusted. Divide 400 by the hours worked to get the new exposure limit .

How does my employer know how much lead is in the air?

Your employer must do an exposure assessment to determine the amount of lead in the air you are breathing. Exposure assessment can be **"air sampling,"** past exposure data from the same job or a similar job, or objective data (Section (d)(3) Basis of initial determination). Examples of objective data are product information and insurance information. Objective data are not often used. Conditions for each job, each day, and even each hour, are constantly changing. When conditions change, you cannot rely on objective data.

Your employer must determine how much lead is in the air for each job type. For example, your employer may do exposure assessment on one scraper, one cleaner, and one person using a heat gun. When your employer does air sampling, your employer must do air sampling on each shift or the shift with the highest exposure. Your employer must also sample the air if any of the employees on the job think they are getting sick because of exposure to lead on the job.

How often does my employer need to sample the air?

Your employer must determine if you are breathing air at or above the Action Level (30 ug/m^3). If your exposure to lead is below the Action Level, your employer does not need to sample again unless the conditions of your job change. If your exposure to lead is at or above the Action Level but below the PEL (50 ug/m^3), then sampling must be done every 6 months. If the amount is above the PEL, then sampling must be done every 3 months.

Your employer must also sample every time the conditions of your job change. For example, your employer needs to sample each time you do an abatement job on a different type of building (Section (d)(6) Frequency and (d)(7) Additional exposure assessments).

How can I find out the results of air sampling?

Your employer is required to give you the results of air sampling within 5 working days after receiving the results. (Section (d)(8) Employee notification)

Am I protected before air sampling is done?

YES! Certain tasks on construction jobs where lead-based paint is present are known to cause large amounts of lead in the air. These tasks are called **"lead related tasks."** The OSHA Standard splits these lead-related task into three different classes . (Section (d)(2) Protection of employees during exposure assessment)

Class 1 tasks

- Manual demolition of structures (for example, dry wall)
- Manual scraping (includes chemical stripping) or sanding
- Using a heat gun
- Power tool cleaning with dust collection systems
- Spray painting with lead-based paint

Your employer must protect you when you do Class 1 tasks as if your lead exposure is above the PEL (50 ug/m^3). Your employer must give you this protection until exposure assessment shows the exposure is less than the PEL. Even when the exposure is lower than 50 ug/m^3, you can request a respirator. Your employer must give you one.

Class 2 tasks

- Using lead-based mortar
- Burning lead
- Rivet busting
- Power tool cleaning without dust collection systems
- Cleanup activities where dry expendable abrasives are used
- Moving or tearing down the enclosure used for abrasive blasting

Your employer must protect you when you do Class 2 tasks as if your lead exposure is above 10 times the PEL (500 ug/m^3). He or she must give you higher protection until exposure assessment shows that your exposure is less than 500 ug/m^3. Even if your exposure is lower, you must still be protected. You can use the chart on the next page and the exposure assessment to find the right respirator for the job.

Laws

Class 3 tasks

- Abrasive blasting
- Welding
- Cutting
- Torch burning

Your employer must protect you when you do Class 3 tasks as if your lead exposure is above 50 times the PEL (2,500 ug/m^3). Your employer must give you this higher protection until exposure assessment show that your exposure is below this level. Even if your exposure is lower, you must still be protected. You can use the chart below to find the right respirator for the job.

SOME RESPIRATORS LEGAL FOR LEAD WORK

Task Class	MUL	Respirator Types
Class 1	500 ug/m^3	• Half-mask, air-purifying
Class 2	1250 ug/m^3	• Loose-fitting hood or helmet PAPR • Hood or helmet with supplied air continuous flow • Type CE continuous flow
Class 2	2500 ug/m^3	• Full-face, air-purifying • Tight-fitting PAPR • Full-face, supplied air, pressure demand • Half-mask or full-face, supplied air, continuous flow
Class 3	50,000 ug/m^3	• Half-mask, supplied air, pressure demand
Class 3	100,000 ug/m^3	• Full-face, supplied air, pressure demand • Type CE pressure demand
Class 3	100,000+ ug/m^3	• Full-face, SCBA, pressure demand

What does my employer have to do?

If you will be exposed above the PEL or you will do any of the lead-related tasks in Classes 1, 2, or 3, your employer must provide the following for workers. (Section (d)(2)(v)(A)-(F))

- Right respirator (See the table on page 13- 8.)
- Personal protective clothing and equipment
- Area to change into and out of your work clothes
- Facilities for hand and face washing
- Place where you can shower at the end of the day, if feasible
- Blood tests reviewed by a doctor
- Training on the hazards of working with lead
- A lead-safe area for eating and drinking
- Warning signs around the work area

Does my employer have to reduce my exposure to the lead in the air?

YES! Your employer must do everything possible to reduce your exposure.

- Use materials or tools which make less lead dust or fumes.
- Change the way you do a job so you create less dust and fumes.
- Rotate schedules so worker exposure to lead is less than a few hours a day.
- Provide you with a respirator.

Your employer must list in writing all the ways he or she is trying to reduce your exposure to lead. This is called a compliance program (Section (e)(2) Compliance Program).

2. Respirators and protective clothing

When must I wear a respirator?

According to the OSHA Standard, you are only required to wear a respirator if you are doing a Class 1, 2, or 3 task or air sampling shows you are exposed above the PEL (50 ug/m^3). But if you are exposed to any amount of lead, the regulations say you can request a respirator from your employer and your employer is required to give you a respirator. This means you can still get a respirator even if you are not exposed to lead above the PEL or doing any of the lead-related tasks.

Your employer must provide a respirator for any employee exposed to lead who asks for one. You may want to have this extra protection, especially if you are planning to have children. To prevent reproductive hazards, OSHA recommends that you not be exposed to lead air levels 35 ug/m^3 or higher without a respirator.

Whenever you are exposed above the PEL, you can always ask your employer for a Powered Air Purifying Respirator (PAPR). If you are exposed above the PEL, by law, your employer must provide you with a PAPR — **if you ask for it** and **if it protects you enough.** If a PAPR is not protective enough for the job — for example, abrasive blasting — then your employer must provide you with a better respirator that is suitable for this type of work. (Section (f)(1)(iv) Respiratory protection)

What type of respirator can I use?

The respirator you use will depend on the amount of lead in the air and the job you are doing. The standard says you must have a respirator at least as protective as those listed in the table on the next page. You can always ask your employer for a Powered Air Purifying Respirator (PAPR). By law, your employer must give you a PAPR if you are exposed above the PEL and you ask for one—and it provides enough protection. Sometimes a PAPR will not protect you enough—for example, if you were doing abrasive blasting. In that case, your employer must give you a better respirator. Any respirator you use must have a stamp of approval by National Institute of Occupational Safety

and Health (NIOSH) or the Mine Safety and Health Administration (MSHA). (Table 1 Respiratory Protection for Lead Aerosols)

What do I need to do before I wear a respirator?

You need to have a medical exam by a doctor to make sure that you can use a respirator safely. Your employer should pay for this exam. You also need fit testing and training about your respirator.

What personal protective equipment do I need other than a respirator?

If you are working in an area with lead above the PEL or if you are doing any of the tasks listed under Class 1, 2, or 3, your employer must give you protective work clothing. (Section (g) Protective work clothing and equipment) This clothing should include:

- Coveralls with a hood
- Booties
- Hard hat
- Gloves
- Face shields or vented goggles

Who has what responsibilities for my protective clothing ?

If you are exposed at or below the PEL (50 ug/m^3), your employer is not required to provide you with protective clothing. If you are exposed above the PEL but below 200 ug/m^3 — or you are doing a Class 1 task — your employer must wash and dry protective clothing or give you new clothing **every week.** If you are exposed at or above 200 ug/m^3, your employer must provide clean or new protective clothing **every day.** If you are doing a Class 2 or 3 task, and an exposure assessment for the task has not been completed, your employer must assume that you are being exposed at the higher levels associated with these tasks. The employer must provide clean or new protective clothing **every day until the assessment determines** that your exposure is less than 200 ug/m^3.

Many employers provide **disposable suits.** These suits are easily torn. You should inspect your protective clothing regularly for tears or rips. If your suit tears or rips and you cannot repair it, you must get a new protective suit.

Some employers provide **reusable, non-disposable protective clothing.** This clothing is usually more durable than the disposable suits, but if it does rip or tear, have it repaired immediately to minimize your chances of being contaminated. If you are given non-disposable protective clothing, your employer is responsible for cleaning, drying, and repairing it. (Section (g)(2) Cleaning and replacement)

Where should I put my used protective clothing?

Your employer must have a closed container in the change area for used protective clothing. The container must be labeled as follows:

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.

This helps to prevent your family and other people living in the community from being exposed to lead. The standard says your employer can not let you leave the work area with protective clothing on.

3. Your workplace

How clean do we keep our job site?

The standard says you must keep all surfaces as free of lead as possible. You must clean-up floors and other surfaces with a vacuum. This vacuum must have a High Efficiency Particulate Air (HEPA) filter. Only use shoveling, dry-sweeping, wet-sweeping, or brushing if your employer shows that vacuuming does not work to pick up the dust on your job site.

Compressed air is allowed on steel structure jobs. Compressed air is not prohibited for some cleaning purposes—if you have proper ventilation and air filtration. You may use compressed air when cleaning the containment on a steel structure job. (Section (h) Housekeeping)

Can we eat or drink on the job?

NO! Your employer must **not** allow you to eat, drink, smoke, chew tobacco, or apply cosmetics in the work area where your exposure to lead is above the PEL. Your employer must have a place where anyone exposed above the PEL can eat and drink safely, away from lead. (Section (i) Hygiene facilities and practices)

Where can we change our clothes and wash?

Whenever you work with lead, your employer must have a place for you to wash your hands and face. Your employer must make sure that you wash your hands and face at the end of each work-shift.

The standard says your employer must have places where anyone exposed above the PEL or doing any of the lead related tasks (Class 1, 2, or 3) can change in and out of their work clothes. Your employer must have a place where anyone exposed above the PEL can shower, if feasible. OSHA officials have said that if your employer decides having a shower is not feasible, he or she must be able to explain their reasoning to any OSHA inspector who comes on the site. (Section (i)(2) Change areas)

Does my employer have to post warning signs in the work area?

Your employer must post warning signs in the work area where employees are exposed above the PEL. (Section (m) Signs) They must say:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

4. Training

How can workers find out about the hazards of lead?

OSHA standard says that employers must provide training to anyone:

- Working with lead at or above the Action Level (30 ug/m^3)
- Doing any of the tasks listed under Class 1, 2, or 3
- Using any lead compounds which cause eye or skin irritation

(Section (l) Employee information and training)

What does the training about lead have to include?

- OSHA Interim Final Lead in Construction Standard
- Jobs that expose workers to lead above the Action Level
- Information on respirators: their use, the different types, and the importance of a proper fit
- Medical exams required for everyone working with lead
- Ways your employer can reduce your exposure to lead
- What your employer is doing to reduce your exposure to lead

5. Recordkeeping

What records does my employer have to keep?

Your employer must keep records of:

- All exposure assessments done on your job site
- The types of respiratory protection worn on your job site
- Names and social security numbers of all employees
- All medical surveillance done on employees
- All training done for employees
- All cases of medical removal of employees

All records must be kept for at least 30 years. (Section (n) Recordkeeping).

Do I have the right to see any of these records?

YES! You have the right to see any of the air sampling results or any other types of exposure assessments done on your job site. You have the right to have a copy of your medical exam and blood test results. You can get copies of either of these types of records. Your employer is required to send a copy of your medical records to anyone you choose. Any requests to send your medical records to someone else should be in writing.

6. Medical surveillance

Special medical exams are required when you work with lead. (Section (j) Medical surveillance) These exams are called medical surveillance. There are two types:

- **Initial medical surveillance**
- **Medical surveillance program**

Initial medical surveillance

Initial medical surveillance is blood tests that check the amount of lead in your blood. It is also called **biological monitoring**. The two blood tests used in the biological monitoring are the blood lead level test and the zinc protoporphyrin (ZPP) test. You need medical surveillance if you do any of the tasks in class 1, 2 or 3 listed in this standard or if you are exposed to lead on the job any one day at or above the Action Level.

On-going medical surveillance program

You need a medical surveillance program if you are or may be exposed to lead on the job at or above the Action Level for **more than 30 days** in any continuous 12 month period. If you are a lead abatement worker, you can be exposed to lead above the Action Level for 30 or more days in a year. When you expect to do lead abatement work for at least 30 days, you should take part in a medical surveillance program.

Who must provide medical surveillance?

Medical surveillance must be provided by your employer.

Your employer must provide medical surveillance for you at no cost to you, the worker — and at a reasonable time and place.

All medical examinations and procedures must be supervised or performed by a licensed physician. Your employer must notify you of the results of the exam within 5 working days. This is called **"notification."** You may have another doctor review the findings and provide a second exam. The employer must pay for the second review. This is called **"multiple physician review."**

What does multiple physician review mean?

If you are not comfortable with the available doctor or do not agree with the doctor's findings, you can request a second medical exam with a doctor of your choice. This request must be made within 15 days after you receive your copy of the initial medical exam results. Your employer must pay for the second exam.

If the doctors do not agree, they are asked to talk with each other. If there is still no agreement, then a third doctor selected by the two previous doctors will review the findings and conduct any necessary exams. The third doctor gives a written recommendation to the employer. The third opinion is followed unless you and your employer jointly agree to follow the recommendation of either of the previous doctors. (Section (j)(3)(iii) Multiple physician review mechanism)

8. Medical treatment

What is the treatment for lead poisoning?

Chelation is the medical treatment for severe lead poisoning. It is a risky treatment. Chelation can get rid of some of the lead in your body, but it can be harmful to your health. Chelation is a serious medical treatment. When possible, you want to know that at least two doctors think it is necessary for you to have it. The second doctor should be a doctor that you know and trust. This second opinion is paid for by your employer, when you request it. This is when the multiple physician review is most helpful.

Prophylactic chelation means giving chelating drugs to someone to try and prevent lead poisoning.. Chelating drugs will not protect anyone from lead poisoning. Chelating drugs will only help remove lead from your body after you have been poisoned. It is illegal for your employer or anyone employed by your employer to give you chelating drugs.

Prophylactic chelation is prohibited. It is illegal.

Chelating drugs are dangerous to your health. They can hide lead poisoning that may be happening to you. The chelating drugs may also make your body take in lead more easily (Section (j)(4) Chelation).

Whenever possible, get a second medical opinion to determine whether you need chelation treatment.

Laws

7. Medical removal

What is medical removal?

Medical removal means that you are removed from the lead exposure on your job. The standard states you must be removed if your blood lead levels get too high. Medical removal can prevent you from getting severe lead poisoning. Removing you from the lead exposure gives your body time to get rid of the lead. Sometimes this is enough to bring the blood lead level down. Medical removal is a way to protect you from becoming lead poisoned. There are two times that you may be medically removed:

Elevated blood lead level

If your blood lead level reaches 50 ug/dl, for the periodic blood test and the follow-up blood test, you must be removed from exposure to lead. It is dangerous for you to work with lead when your blood lead level is so high. **You cannot wear a respirator to lower your exposure when your blood lead level is so high.** If you get more lead into your body, you could become lead poisoned. Your employer must provide you with a job with no lead exposure. If your employer cannot, he/she must pay you your normal wages until your blood lead level is at 40 ug/dl on two separate tests. You then return to your former job. If your blood lead level remains above 40 ug/dl, your wages must be paid as long as the job exists or up to 18 months. **This is called medical removal protection.**

Final medical determination

Final medical determination means the doctor has given a written medical opinion to remove you from lead exposure. The doctor believes that you have a medical problem that will be affected by lead exposure. The doctor believes that the risk to your health is high. **The doctor must inform the employer of the medical recommendation regarding working with lead.**

The doctor does not tell the employer what the medical problem is, but states that you are at high risk of ill health with lead exposure.

2. Complete physical exam to look at your:
   a. Blood
   b. Teeth and gums
   c. Stomach and intestines
   d. Kidneys
   e. Nerves
   f. Brain
   g. Heart
   h. Lungs
3. Blood pressure check
4. Blood tests which will show
   a. Blood lead level
   b. ZPP
   c. Hemoglobin & hematocrit (anemia test)
   d. Blood urea nitrogen
   e. Serum creatinine (kidney test)
5. Routine urinalysis (kidney and protein check)
6. Any additional test that the doctor needs to do to determine how lead has or could affect you. Pregnancy testing and male fertility must be provided if you request them.

Medical exam and consultation

You have the right to a medical exam and consultation whenever you will be working with lead at or above the Action Level for 30 days or more and

- Anytime you are working with lead and you feel sick with any of the signs and symptoms of lead poisoning.
- Yearly when you have a blood lead level at or above 40 ug/dl.
- Whenever you are concerned about having a healthy baby.
- If you have difficulty breathing while wearing a respirator.

You need to notify your employer that you want the medical exam and consultation. The content of this medical exam and consultation is determined by the doctor. (Section (j)(3) Medical exam and consultation)

The on-going medical surveillance program has three types of exams. The doctor must follow the standard and provide:

- **Blood tests for biological monitoring**
- **Six-part medical exam**
- **Medical exam and consultation**

Blood tests for biological monitoring

The blood lead level and ZPP tests are required:

1. When you begin working with lead and every 2 months for the first 6 months and then every 6 months as long as you are working with lead at or above the Action Level for 30 or more days within a year's time period.

2. When your blood lead level results are at or above 40 ug/dl, you must be tested at least every 2 months until two consecutive blood lead level results are below 40 ug/dl.

3. When your blood lead level results are at or above 50 ug/dl, you must be tested again within 2 weeks. If the second test result is at or above 50 ug/dl, you must be medically removed and tested at least every month until you reach a blood lead level of 40 ug/dl or less on two separate testing dates. The tests must be taken at least 30 days apart.

Six-part medical exam

Your employer must make the required 6-part medical exam in the medical surveillance program available to you whenever you will be working with lead at or above the Action Level for 30 or more days and your blood lead level results are 40 ug/dl or above. (Section (j)(3)(ii) Content)

1. Interview about your work and medical history:
   a. Past lead exposures
   b. Personal habits like smoking and hygiene
   c. Previous medical problems with the kidneys, heart, nerves, blood, stomach, intestines, and reproductive organs

You may return to work with lead when the doctor determines that you no longer have a medical problem that puts you at high risk of ill health with lead exposure. The doctor must put the medical opinion in writing. You then return to your former job. While you are unable to work with lead, your employer must provide you with another job where your lead exposure is not above the action level. If another job is not available, your employer must pay your wages for as long as the job exists or up to 18 months.

A doctor may use a final medical determination if you say you want to have children and your blood lead level is 30 ug/dl. You will then be placed on medical removal protection. OSHA recommends that a Maximum Permissible blood lead level of 30 ug/dl should not be exceeded in males and females who wish to have children. (Section (k)(1) Temporary medical removal and return of an employee)

What is medical removal protection?

Medical removal protection means that your job will be protected if you must be medically removed from your lead abatement job. Under the OSHA Lead Standard, your employer must pay your salary and benefits and maintain your seniority while you are medically removed. This medical removal protection will last as long as the job exists or up to 18 months. (Section (k)(2) Medical removal protection benefits)

Title X Fact Sheet

The "Residential Lead-Based Paint Hazard Reduction Act of 1992" is also known as Title X. Title X requires different government agencies to help reduce the amount of lead poisoning in this country. This fact sheet lists some of the important parts of Title X.

Why was Title X passed?

The United State Congress received information that:

- Three million American children under the age of 6 have at least low-level lead poisoning.
- Lead poisoning in children can cause reading and learning disabilities, hyperactivity, and behavior problems.
- Ingesting lead dust from deteriorating lead-based paint is the most common cause of lead poisoning.
- Homes built before 1980 contain more than 3 million tons of lead in the form of lead-based paint.
- As many as 3,800,000 American homes have chipping or peeling lead-based paint.
- The dangers of lead-based paint hazards can be reduced by abating lead-based paint or by using interim controls to prevent paint deterioration.
- Even though laws were passed in the early 1970's, until now the government has actually done very little to reduce lead-based paint hazards.

Title X is designed to eliminate lead-based paint hazards before they poison children. In the past, many agencies only got rid of lead-based paint after a child had been poisoned.

What is the law designed to do?

- Develop a system of trained people to evaluate and reduce lead hazards.
- Reduce childhood lead poisoning.
- Use government funds in the most cost-effective way to eliminate lead-based paint hazards.
- Educate the public concerning the hazards and sources of lead poisoning.
- Remove lead-based paint hazards first from federal housing.

The Federal Government to be a "model landlord."

- **Project-based, federally-assisted housing built before 1960** must have a risk assessment by January 1, 1996.
- **Project-based, federally-assisted housing built from 1960 to 1978** must have a risk assessment done by 2002.
- **Pre-1978 federally assisted housing** must be inspected before any rehabilitation work is done which might disturb lead-based paint.
- **Lead-based paint hazards must be abated or reduced** during rehabilitation of federally-assisted housing projects depending on funding. Anyone purchasing or renting a housing unit built before 1978 must be given an EPA Lead Hazard Information Pamphlet. This does not apply to tenant-based assistance such as Section 8.

Who has to be trained?

Title X requires EPA to issue specific requirements for how contractors, workers, supervisors, inspectors and risk assessors will be trained in lead-based paint hazards. EPA must issue these regulations by April 1994. These requirements will also say how contractors, workers, supervisors, inspectors and risk assessors will be certified. EPA has in place university-based national network of Regional Lead Training Centers. (See the listing in the For More Information section at the end of the manual.) As part of the EPA program, lead training programs will need to be accredited. Only this training will qualify as certification.

Will each state have its own certification program?

Each state may have its own program which is approved by EPA. EPA will run the certification program in states that do not have their own programs. EPA will issue a model-state certification program to help states set up their own programs. Because all state programs must be based on EPA's model plan, each state's program should be the same or very similar.

Will workers doing lead abatement jobs be protected?

The OSHA Interim Final Lead in Construction Standard became law on June 3, 1993. This standard includes specific requirements for protecting workers doing lead abatement jobs.

When does lead-based paint become a hazard?

EPA must issue standards on how much:

- Lead dust is allowed on the floors, windows, or air before abatement must be done.
- Lead is allowed in soil before it must be removed.

How does the government plan to educate the public?

Title X requires EPA and HUD to issue regulations which will require property owners to give each person buying or renting a property built before 1978:

- An EPA Lead Hazard Information Pamphlet.
- Any information about lead-based paint hazards in the property.
- At least 10 days to conduct an inspection of the property for lead-based paint hazards.

In addition, the sales contract for homes built before 1978 must include a statement warning about the hazards of lead-based paint.

How will people know what are the best products to use?

EPA must develop performance standards by April 1995 for all products and devices used to evaluate, reduce and abate lead-based paint hazards.

Who will make sure the laws really help solve the problem?

Title X requires the HUD Secretary and the EPA Administrator to set up a task force of federal agencies and other organizations with knowledge about lead-based paint activities. The task force will make recommendations to EPA and HUD on developing standards and dealing with the concerns of property owners.

Laws

YOUR STATE LAWS

Appendix 16: Summary of CDC Lead Poisoning Statement

Chapter 1 of the Centers for Disease Control and Prevention (CDC) statement on Preventing Childhood Lead Poisoning

Introduction

Summary

New data indicate significant adverse effects of lead exposure in children at blood lead levels previously believed to be safe. Some adverse health effects have been documented at blood lead levels at least as low as 10 micrograms per deciliter of whole blood (µg/dL).

The 1985 intervention level of 25 µg/dL is, therefore, being revised downwards to 10 µg/dL.

A multitier approach to follow-up has been adopted.

Primary prevention efforts (that is, elimination of lead hazards before children are poisoned) must receive more emphasis as the blood lead levels of concern are lowered.

The goal of all lead poisoning prevention activities should be to reduce children's blood lead levels below 10 µg/dL. If many children in the community have blood lead levels of ≥10 µg/dL, communitywide interventions (primary prevention activities) should be considered by appropriate agencies. Interventions for individual children should begin at blood lead levels of 15 µg/dL.

Childhood lead poisoning is one of the most common pediatric health problems in the United States today, and it is entirely preventable. Enough is now known about the sources and pathways of lead exposure and about ways of preventing this exposure to being the efforts to eradicate permanently this disease. The persistence of lead poisoning in the United States, in light of all that is know, presents a singular and direct challenge to public health authorities, clinicians, regulatory agencies, and society.

> Lead poisoning is one of the most common and preventable pediatric health problems today.

Lead is ubiquitous in the human environment as a result of industrialization. It has no known physiologic value. Children are particularly susceptible to lead's toxic effects. Lead poisoning, for the most part, is silent: most poisoned children have no symptoms. The vast majority of cases, therefore, go undiagnosed and untreated. Lead poisoning is widespread. It is not solely a problem of inner city or minority children. No socioeconomic group, geographic area, or racial or ethnic population is spared.

Previous lead statements issued by the Centers for Disease Control and Prevention (CDC) have acknowledged the adverse effects of lead at lower and lower levels. In the most recent previous CDC lead statement, published in 1985, the threshold for action was set at a blood lead level of 25 µg/dL, although it was acknowledged that adverse effects occur below that level. In the past several years, however, the scientific evidence showing that some adverse effects occur at blood lead levels at least as low as 10 µg/dL in children has become so overwhelming and compelling that it must be a major force in determining how we approach childhood lead exposure.

This document provides guidelines on childhood lead poisoning prevention for diverse groups. Public health programs that screen children for lead poisoning look to this document for guidance on screening regimens and public health actions. Pediatricians and other health-care practitioners look to this document for information on screening and guidance on the medical treatment of poisoned children. Government agencies, elected officials, and private citizens seek guidance about what constitutes a harmful level of lead in blood - what the current definition of lead poisoning is and what blood lead levels should trigger environmental and other interventions.

It is not possible to select a single number to define lead poisoning for the various purposes of all of these groups. Epidemiologic studies have identified harmful effects of lead in children at blood lead levels at least as low as 10 µg/dL. Some studies have suggested harmful effects at even lower levels, but the body of information accumulated so far is not adequate for effects below about 10 µg/dL to be evaluated definitively. As yet, no threshold has been identified for the harmful effects of lead.

Because 10 µg/dL is the lower level of the range at which effects are now identified, primary prevention activities - community-wide environmental interventions and nutritional and educational campaigns - should be directed at reducing children's blood lead levels at least to below 10 µg/dL. Blood lead levels between 10 and 14 µg/dL are in a border zone. While the overall goal is to reduce children's blood lead levels below 10 µg/dL, there are several reasons for not attempting to do interventions directed at individual children to lower blood lead levels of 10-14 µg/dL. First, particularly at low blood lead levels, laboratory measurements may have some inaccuracy and imprecision, so a blood lead level in this range may, in fact, be below 10 µg/dL. Secondly, effective environmental and medical interventions for children with blood lead levels in this range have not yet been identified and evaluated. Finally, the sheer numbers of children in this range would preclude effective case management and would detract from the individualized follow-up required by children who have higher blood lead levels.

The single, all-purpose definition of childhood lead poisoning has been replaced with a multitier approach, described in Table 1-1. Community prevention activities should be triggered by blood lead levels ≥ 10 µg/dL. Medical evaluation and environmental investigation and remediation should be done for all children with blood lead levels ≥ 20 µg/dL. All children with blood lead levels ≥ 15 µg/dL should receive individual case management, including nutritional and educational interventions and more frequent screening. Furthermore, depending on the availability of resources, environmental investigation (including a home inspection) and remediation should be done for children with blood lead levels of 15-19 µg/dL, if such levels persist. The highest priority should continue to be the children with the highest blood lead levels.

Other differences between the 1985 and 1991 statements are as follows:

Screening test of choice. Because the erythrocyte protoporphyrin level is not sensitive enough to identify children with elevated blood lead levels below about 25 µg/dL, the screening test of choice is now blood lead measurement.

Universal screening. Since virtually all children are at risk for lead poisoning, a phase in of universal screening is recommended, except in communities where large numbers or percentages of children have been screened and found not to have lead poisoning. The full implementation of this will require the ability to measure blood lead levels of capillary samples and the availability of cheaper and easier-to-use methods of blood lead measurement.

Table 1-1. Interpretation of blood lead test results and follow-up activities: class of child based on blood lead concentration

Class	Blood lead concentration (µg/dL)	Comment
I	≤ 9	A child in Class I is not considered to be lead-poisoned.
IIA	10-14	Many children (or a large proportion of children) with blood lead levels in this range should trigger community-wide childhood lead poisoning prevention activities (chapter 9). Children in this range may need to be rescreened more frequently.
IIB	15-19	A child in Class IIB should receive nutritional and educational interventions and more frequent screening. If the blood lead level persists in this range, environmental investigation and intervention should be done (Chapter 8).
III	20-44	A child in Class III should receive environmental evaluation and remediation (Chapter 8) and a medical evaluation (Chapter 7). Such a child may need pharmacologic treatment of lead poisoning (Chapter 7).
IV	45-69	A child in Class IV will need both medical and environmental interventions, including chelation therapy (Chapters 7 and 8).
V	≥70	A child with Class V lead poisoning is a medical emergency. Medical and environmental management must begin immediately (Chapters 7 and 8).

Primary prevention. Efforts need to be increasingly focused on preventing lead poisoning before it occurs. This will require community-wide environmental interventions, as well as educational and nutritional campaigns.

Succimer. In January, 1991, the US Food and Drug Administration approved succimer, an oral chelating agent, for chelation of children with blood lead levels over 45 µg/dL.

Childhood lead poisoning prevention programs have had a tremendous impact on reducing the occurrence of lead poisoning in the United States. Because of these programs, deaths from lead poisoning and lead encephalopathy are now rare. These programs have targeted high-risk children for periodic screening; provided education to caretakers about the causes, effects, symptoms, and treatments for lead poisoning; and ensured medical treatment and environmental remediation for poisoned children. Screening and medical treatment of poisoned children will remain critically important until the environmental sources most likely to poison children are eliminated.

Federal regulatory and other actions have results in substantial progress in reducing blood lead levels in the entire US population. In the last two decades, the virtual elimination of lead from gasoline has been reflected in reductions in blood lead levels in children and adults. Lead levels in food have also decreased since most manufacturers stopped using leaded solder in cans and since atmospheric deposition of lead on food crops declined as a result of reductions of lead in gasoline. In 1978, the Consumer Product Safety Commission banned the addition of lead to new residential paint.

Nevertheless, important environmental sources and pathways of lead remain. Lead-based paint and lead-contaminated dusts and soils remain the primary sources and pathways of lead exposure for children. In addition, children continue to be exposed to lead through air, water, and food, as well as occupations and hobbies of parents and caretakers. The focus of prevention efforts, therefore, must expand from merely identifying and treating individual children to include primary prevention - preventing exposure to lead before children become poisoned. This will require a shared responsibility among many public and private agencies. Public agencies will have to work with pediatric health-care providers to identify communities with childhood lead-poisoning prevention problems and unusual sources of lead and to ensure environmental follow-up of poisoned children. Public housing and economic development agencies will have to integrate lead paint abatement into housing rehabilitation policies and programs. Health-care providers will need to phase in virtually universal screening of children. Public and private organizations must continue to develop economical and widely-available blood lead tests to make such screening possible. Public and private housing owners must bear a portion of the financial burden for abatement.

The changes in this statement are not meant to create an enormous burden on primary pediatric health-care providers. These changes will only be useful if public health and other agencies effectively complement health-care providers' activities. Several efforts have begun to increase federal support of childhood lead poisoning prevention programs and of follow-up activities. On-going efforts to develop infrastructure and technology by the public and private sectors include 1) the development of inexpensive, easy-to-use portable methods for measuring blood lead levels; 2) the development of training and certification programs for lead paint inspectors and abatement contractors; and 3) the development and testing of new abatement methods, including encapsulants. The changes in this statement are also not meant to increase the emphasis on screening of children; the long-term goal of this statement is **prevention**. Until primary

prevention of childhood lead poisoning can be achieved, however, increased screening and follow-up of poisoned children is essential.

Elimination of Childhood Lead Poisoning

Will require efforts from both the private and public sectors.
Will require a shift in emphasis to primary prevention.
Will take time and resources.
Should proceed in a rational manner, with the highest risk children being made the highest priority.
Can be achieved.

In February 1991, the US Department of Health and Human Services released a *Strategic Plan for the Elimination of Childhood Lead Poisoning* (HHS, 1991). This plan describes the first 5 years of a 20-year society-wide effort to eliminate this disease. It places highest priority on first addressing the children at greatest risk for lead poisoning. The US Department of Housing and Urban Development (HUD, 1990) and the Environmental Protection Agency (EPA, 1991) have both released plans dealing with the elimination of lead hazards. To eliminate this disease will require a tremendous effort from all levels of government as well as the private sector, but we believe that the benefits to society will be well worth it. We look forward to the day when childhood lead poisoning is no longer a public health problem.

References

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