ASBESTOS & LEAD PAINT SURVEY

March 4th, 2023

Reedsport Community Charter School
2260 Longwood Dr,
Reedsport, OR 97467
Douglas County

EIS Job No. 2022077

Prepared For:

Reedsport School District
C/O Michael Schoppe
100 Ranch Road
Reedsport, OR 97467
Cell: (503) 799-0486
E-mail: mschoppe@reedsport.k12.or.us

Prepared By:

Environmental Inspection Services Pro, LLC
Matthew C. Spear, Environmental Professional
430 N First St.
Carlton, OR 97111
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E-mail: charles_a_spear@yahoo.com

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1.0 EXECUTIVE SUMMARY

Asbestos & Lead Paint Survey

March 4th, 2023

Reedsport Community Charter School
2260 Longwood Dr,
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Douglas County

Reedsport School District
C/O Michael Schoppe

Dear Mr. Michael Schoppe,

Matthew C. Spear, the AHERA-certified asbestos inspector, and Lead Paint RRP certified renovator surveyed a portion of the subject Reedsport Community Charter School at 2260 Longwood Dr in the downtown area of Reedsport, OR on February 17th, 2023. The EIS inspector surveyed a portion of the subject building for suspect asbestos-containing building materials (ACBM) and collected a total of sixty (60) bulk samples from various homogenous and non-homogonous areas. The results are not favorable and do indicate areas of asbestos-containing building materials throughout the sampled area in the form of miscellaneous asbestos-containing material (ACM). A portion of the building was also surveyed for the presence of lead paint, through the collection of five (5) samples. The results are favorable, with no positive indication of lead paint within the subject area, based on the samples taken.

This hazardous material survey aimed to detect or rule out the presence of ACM and Lead paint, prior to a partial seismic upgrade to the West side of the structure. This sampling procedure is required to comply with ODEQ and Douglas County pre-construction and demolition requirements. The scope of work of this hazardous material survey included the West side of the building, as indicated in Appendix 1.0. This includes materials such as interior finishes, wall assemblies, floor assemblies, roof assemblies, insulation systems, and exterior finishes.

The building surveyed is described as a Jr/Sr school in central downtown Reedsport. Previous uses of the building are strictly institutional, according to the school district. The current use of the building is also institutional only, with no residential activities noted at this time. This building construction date is unknown at this time, though we do know construction was phased. The building is approx. 156,500 SF. The structure is wood framed, upon a concrete foundation with two habitable floors and a sealed attic space between the ceiling and the roof structure. Subsequent remodel efforts were made to the building based on material findings, but no record of dates was found. The scope of the proposed alteration of the building is the partial seismic upgrade of the West side of the

structure, which will affect many building systems as previously mentioned. See Appendix 1.0 for scope of work details.

4 non-friable asbestos-containing materials were identified in the survey. These materials were sampled to identify asbestos that will require removal before scheduled demolition activities. Trace sample test results of less than <1 percent are considered actionable and require abatement activities for this report (unless adequately retested and proved asbestos-free). These materials are listed in the following table:

SAMPLE #	RESULT	MATERIAL	DESCRIPTION	LOCATION	CONDITION	F/NF	AMOUNT (SF)
0046	4% chrysotile	Misc.	Brown 9" x 9" VAT w/ black mastic	N Classroom Flooring	Fair	Non-Friable	300+ SF
0047	4% chrysotile	Misc.	Brown 9" x 9" VAT w/ black mastic	N Classroom Flooring	Fair	Non-Friable	300+ SF
0055	4% chrysotile	Misc.	Green 9" x 9" VAT w/ black mastic	N Classroom Flooring	Fair	Non-Friable	300+ SF
0056	4% chrysotile	Misc.	Green 9" x 9" VAT w/ black mastic	N Classroom Flooring	Fair	Non-Friable	300+ SF

The recommended response actions to deal with the identified asbestos-containing building materials (ACBM) are as follows:

- Hire an accredited & licensed asbestos abatement contractor to remove all positive ACBM. Non-friable confirmed ACBM shall be concealed prior to demolition.
- Restrict access to areas where ACBM has been confirmed to "authorized personnel only" during pre-demolition and active demolition.
- Conduct additional sampling to restricted areas once the identified ACBMs and non-ACBMs have been cleared from the structure.

The bulk samples of suspect ACBM & Lead paint material were collected in a statistically random manner and the samples were collected from the functional living areas and wall and ceiling areas described in the report. The samples were determined to be representative of all functional areas. All accessible spaces within this structure were inspected and homogeneous building materials were sampled for asbestos analysis. Destructive methods such as wall penetration and floor cutting were utilized to collect representative samples from observed building materials. Any inaccessible areas, due to current construction, operation, or hidden by surface materials will need to be sampled if deemed to be outside the identified homogenous sample areas. Limitations noted during the inspection were: Inaccessible attic space (destructive sampling methods only), inaccessible crawl space (destructive sampling methods only), wall chase spaces, and roof layers (beyond the top layer of asphalt roof shingles).

The bulk samples were placed into re-labeled sample bags and submitted with a chain of custody documentation to EHS Laboratories located at 7469 Whitepine Road in Richmond, Virginia on February 17th, 2022, and results were received by EIS on March 1st, 2023.

The bulk samples were analyzed for the presence of asbestos by Polarized Light Microscopy per Test Method PLM EPA 600/R-93/116. Polarized Light Microscopy (PLM) is the EPA-approved method for analyzing bulk materials for asbestos. PLM utilizes a light microscope equipped with polarizing filters. The actual identification of asbestos fiber bundles is determined by the visual properties displayed when the sample is treated with various dispersion staining liquids. A copy of the actual analytical test results and chain of custody documentation is attached for review (see appendix 2.0). If there are any questions, feel free to contact me on my cell at (503) 680-6398.

Respectfully submitted,

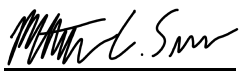
Environmental Inspection Services Pro, LLC
430 N First St.
Carlton, OR 97111
Bus: (503) 680-6398
E-mail: charles_a_spear@yahoo.com

Matthew C. Spear, Environmental Professional
Cell: (503) 944-9818
Certificate: IN-22-0717C

Date:

3/4/2023

Signature:



APPENDIXES

APPENDIX 1.0

FIELD SAMPLING RECORD

Sample #	Material	Location	Description	LF/SF/EA	PA#
Note: All room descriptions to be verified.					
1	Misc	Typ. Classroom Flooring	12"x 12" Speckled white vinyl flooring w/ mastic	3000+ SF	See AHERA
2	Misc	Typ. Classroom Flooring	12"x 12" Speckled white vinyl flooring w/ mastic	3000+ SF	See AHERA
3	Misc	Typ. Classroom Flooring	12"x 12" Speckled white vinyl flooring w/ mastic	3000+ SF	See AHERA
4	Misc	Typ. Classroom Flooring	12"x 12" Speckled white vinyl flooring w/ mastic	3000+ SF	See AHERA
5	Misc	Typ. Classroom Flooring	12"x 12" Speckled white vinyl flooring w/ mastic	3000+ SF	See AHERA
6	Misc	Typ. Classroom Flooring	12"x 12" Speckled white vinyl flooring w/ mastic	3000+ SF	See AHERA
7	Misc	Typ. Classroom Flooring	12"x 12" Speckled white vinyl flooring w/ mastic	3000+ SF	See AHERA
8	Misc	Typ. Classroom Base	6" black vinyl base w/ white mastic	1000+ LF	See AHERA
9	Misc	Typ. Classroom Base	6" black vinyl base w/ white mastic	1000+ LF	See AHERA
10	Misc	Typ. Classroom Base	6" black vinyl base w/ white mastic	1000+ LF	See AHERA
11	Misc	Typ. Classroom Base	6" black vinyl base w/ white mastic	1000+ LF	See AHERA
12	Misc	Typ. Classroom Base	6" black vinyl base w/ white mastic	1000+ LF	See AHERA
13	Misc	Typ. Classroom Base	6" black vinyl base w/ white mastic	1000+ LF	See AHERA
14	Misc	Typ. Classroom Base	6" black vinyl base w/ white mastic	1000+ LF	See AHERA
15	Surfacing	Typ. Classroom Wall Texture	Wall plaster w/ texture	5000+ SF	See AHERA
16	Surfacing	Typ. Classroom Wall Texture	Wall plaster w/ texture	5000+ SF	See AHERA
17	Surfacing	Typ. Classroom Wall Texture	Wall plaster w/ texture	5000+ SF	See AHERA
18	Surfacing	Typ. Classroom Wall Texture	Wall plaster w/ texture	5000+ SF	See AHERA
19	Surfacing	Typ. Classroom Wall Texture	Wall plaster w/ texture	5000+ SF	See AHERA
20	Surfacing	Typ. Classroom Wall Texture	Wall plaster w/ texture	5000+ SF	See AHERA
21	Surfacing	Typ. Classroom Wall Texture	Wall plaster w/ texture	5000+ SF	See AHERA
22	Surfacing	Typ. Classroom Wall Texture	Wall plaster w/ texture	5000+ SF	See AHERA
23	Surfacing	Typ. Classroom Wall Texture	Wall plaster w/ texture	5000+ SF	See AHERA
24	Surfacing	Typ. Classroom Wall Texture	Wall plaster w/ texture	5000+ SF	See AHERA
25	Misc	Typ. Classroom Wall Board	Gypsum wall board w/ mud, tape, and texture	5000+ SF	See AHERA
26	Misc	Typ. Classroom Wall Board	Gypsum wall board w/ mud, tape, and texture	5000+ SF	See AHERA
27	Misc	Typ. Classroom Wall Board	Gypsum wall board w/ mud, tape, and texture	5000+ SF	See AHERA
28	Misc	Typ. Classroom Wall Board	Gypsum wall board w/ mud, tape, and texture	5000+ SF	See AHERA
29	Misc	Typ. Classroom Wall Board	Gypsum wall board w/ mud, tape, and texture	5000+ SF	See AHERA
30	Misc	Typ. Classroom Wall Board	Gypsum wall board w/ mud, tape, and texture	5000+ SF	See AHERA
31	Misc	Typ. Classroom Wall Board	Gypsum wall board w/ mud, tape, and texture	5000+ SF	See AHERA
32	Misc	Typ. Classroom Ceiling Tile	12" x 12" Ceiling Tile w/ texture	2500+ SF	See AHERA
33	Misc	Typ. Classroom Ceiling Tile	12" x 12" Ceiling Tile w/ texture	2500+ SF	See AHERA
34	Misc	Typ. Classroom Ceiling Tile	12" x 12" Ceiling Tile w/ texture	2500+ SF	See AHERA
35	Misc	Typ. Classroom Ceiling Tile	12" x 12" Ceiling Tile w/ texture	2500+ SF	See AHERA
36	Misc	Typ. Classroom Ceiling Tile	12" x 12" Ceiling Tile w/ texture	2500+ SF	See AHERA
37	Misc	Typ. Classroom Ceiling Tile	12" x 12" Ceiling Tile w/ texture	2500+ SF	See AHERA
38	Misc	Typ. Classroom Ceiling Tile	12" x 12" Ceiling Tile w/ texture	2500+ SF	See AHERA
39	Misc	Typ. Classroom Wall insulation	Fiberglass wall insulation	5000+ SF	See AHERA
40	Misc	Typ. Classroom Wall insulation	Fiberglass wall insulation	5000+ SF	See AHERA
41	Misc	Typ. Classroom Wall insulation	Fiberglass wall insulation	5000+ SF	See AHERA
42	Misc	Typ. Classroom Wall insulation	Fiberglass wall insulation	5000+ SF	See AHERA
43	Misc	Typ. Classroom Wall insulation	Fiberglass wall insulation	5000+ SF	See AHERA
44	Misc	Typ. Classroom Wall insulation	Fiberglass wall insulation	5000+ SF	See AHERA
45	Misc	Typ. Classroom Wall insulation	Fiberglass wall insulation	5000+ SF	See AHERA
46	Misc	N Classroom flooring	Brown 9" x 9" vinyl tile	300+ SF	See AHERA
47	Misc	N Classroom flooring	Brown 9" x 9" vinyl tile	300+ SF	See AHERA
48	Surfacing	Typ. Classroom ceiling texture	Speckled texture	2000+ SF	See AHERA
49	Surfacing	Typ. Classroom ceiling texture	Speckled texture	2000+ SF	See AHERA
50	Surfacing	Typ. Classroom ceiling texture	Speckled texture	2000+ SF	See AHERA
51	Surfacing	Typ. Classroom ceiling texture	Speckled texture	2000+ SF	See AHERA
52	Surfacing	Typ. Classroom ceiling texture	Speckled texture	2000+ SF	See AHERA
53	Surfacing	Typ. Classroom ceiling texture	Speckled texture	2000+ SF	See AHERA
54	Surfacing	Typ. Classroom ceiling texture	Speckled texture	2000+ SF	See AHERA
55	Misc	N Classroom flooring	Green 9" x 9" vinyl tile	300+ SF	See AHERA
56	Misc	N Classroom flooring	Green 9" x 9" vinyl tile	300+ SF	See AHERA
57	Misc	Typ. Classroom Window	White window caulking sealant	500+ LF	See AHERA
58	Misc	Typ. Classroom Window	White window caulking sealant	500+ LF	See AHERA
59	Misc	Typ. Roof Insulation	Fiberglass Roof insulation	5000+ SF	See AHERA
60	Misc	Typ. Roof Insulation	Fiberglass Roof insulation	5000+ SF	See AHERA

Sample #	Material	Location	Description	LF/SF/EA	PA#

Note: All room descriptions to be verified.

PB01	Paint chip	Typ. classroom	Tan paint	3000+ SF	N/A
PB02	Paint chip	Typ. classroom	Tan paint	3000+ SF	N/A
PB03	Paint chip	Typ. Office	White paint	1000+ SF	N/A
PB04	Paint chip	Typ. Office	White paint	1000+ SF	N/A
PB05	Paint chip	N Classroom	Blue paint	500+ SF	N/A

APPENDIX 2.0

ASBESTOS CHAIN-OF-CUSTODY & ANALYTICAL TEST RESULTS

Environmental Hazards Services, L.L.C.
7469 Whitepine Rd
Richmond, VA 23237
Telephone: 800.347.4010

Asbestos Bulk Analysis Report

Report Number: 23-02-04376

Client: Environmental Hazard Services Pro LLC
430 N First Street
Carlton, OR 97111

Received Date: 02/24/2023
Analyzed Date: 02/28/2023
Reported Date: 03/01/2023

Project/Test Address: Reedsport Community Charter School; 2260 Longwood Dr

Client Number: 38-1916

Fax Number: 503-678-5063

Laboratory Results

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-001A	1	Tile	White Vinyl; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-001B	1	Mastic	Purple Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-002A	2	Tile	White Vinyl; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-002B	2	Mastic	Purple Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-003A	3	Tile	White Vinyl; Homogeneous	NAD	100% Non-Fibrous

Client Number: 38-1916 Report Number: 23-02-04376

Project/Test Address: Reedsport Community Charter School;
2260 Longwood Dr

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-003B	3	Mastic	Purple Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-004A	4	Tile	White Vinyl; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-004B	4	Mastic	Purple Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-005A	5	Tile	White Vinyl; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-005B	5	Mastic	Purple Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-006A	6	Tile	White Vinyl; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-006B	6	Mastic	Purple Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-007A	7	Tile	White Vinyl; Homogeneous	NAD	100% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 38-1916 Report Number: 23-02-04376

Project/Test Address: Reedsport Community Charter School; 2260 Longwood Dr

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-007B	7	Mastic	Purple Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-008A	8	Cove Base	Black Vinyl; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-008B	8	Mastic	White Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-009A	9	Cove Base	Black Vinyl; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-009B	9	Mastic	White Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-010A	10	Cove Base	Black Vinyl; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-010B	10	Mastic	White Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-011A	11	Cove Base	Black Vinyl; Homogeneous	NAD	100% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 38-1916 Report Number: 23-02-04376

Project/Test Address: Reedsport Community Charter School; 2260 Longwood Dr

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-011B	11	Mastic	White Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-012A	12	Cove Base	Black Vinyl; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-012B	12	Mastic	White Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-013A	13	Cove Base	Black Vinyl; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-013B	13	Mastic	White Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-014A	14	Cove Base	Black Vinyl; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-014B	14	Mastic	White Adhesive; Homogeneous	NAD	100% Non-Fibrous
23-02-04376-015	15		White Granular; Beige Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous

Client Number: 38-1916 Report Number: 23-02-04376

Project/Test Address: Reedsport Community Charter School;
2260 Longwood Dr

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-016	16		White Granular; Beige Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-017	17		White Granular; Beige Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-018	18		White Granular; Beige Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-019	19		White Granular; Beige Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-020	20		White Granular; Beige Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-021	21		White Granular; Beige Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-022	22		White Granular; Beige Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 38-1916 Report Number: 23-02-04376

Project/Test Address: Reedsport Community Charter School;
2260 Longwood Dr

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-023	23		White Granular; Beige Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-024	24		White Granular; Beige Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-025	25		White Powdery; Brown Fibrous; White Textured Paint-Like; Inhomogeneous	NAD	15% Cellulose 85% Non-Fibrous
23-02-04376-026	26		White Powdery; Brown Fibrous; White Textured Paint-Like; Inhomogeneous	NAD	15% Cellulose 85% Non-Fibrous
23-02-04376-027	27		White Powdery; Brown Fibrous; White Textured Paint-Like; Inhomogeneous	NAD	15% Cellulose 85% Non-Fibrous
23-02-04376-028	28		White Powdery; Brown Fibrous; White Textured Paint-Like; Inhomogeneous	NAD	15% Cellulose 85% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 38-1916 Report Number: 23-02-04376

Project/Test Address: Reedsport Community Charter School;
2260 Longwood Dr

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-029	29		White Powdery; Brown Fibrous; White Textured Paint-Like; Inhomogeneous	NAD	15% Cellulose 85% Non-Fibrous
23-02-04376-030	30		White Powdery; Brown Fibrous; White Textured Paint-Like; Inhomogeneous	NAD	15% Cellulose 85% Non-Fibrous
23-02-04376-031	31		White Powdery; Brown Fibrous; White Textured Paint-Like; Inhomogeneous	NAD	15% Cellulose 85% Non-Fibrous
23-02-04376-032	32		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-033	33		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-034	34		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous

Client Number: 38-1916 Report Number: 23-02-04376

Project/Test Address: Reedsport Community Charter School;
2260 Longwood Dr

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-035	35		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-036	36		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-037	37		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-038	38		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-039	39		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-040	40		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-041	41		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 38-1916 Report Number: 23-02-04376

Project/Test Address: Reedsport Community Charter School;
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Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-042	42		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-043	43		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-044	44		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-045	45		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-046A	46	Tile	Brown Vinyl; Homogeneous	4% Chrysotile	96% Non-Fibrous
			Total Asbestos:	4%	
23-02-04376-046B	46	Mastic	Black Adhesive; Homogeneous	2% Chrysotile	98% Non-Fibrous
			Total Asbestos:	2%	
23-02-04376-047A	47	Tile	Brown Vinyl; Homogeneous	4% Chrysotile	96% Non-Fibrous
			Total Asbestos:	4%	

Environmental Hazards Services, L.L.C

Client Number: 38-1916 Report Number: 23-02-04376

Project/Test Address: Reedsport Community Charter School;
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Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-047B	47	Mastic	Black Adhesive; Homogeneous	2% Chrysotile	98% Non-Fibrous
			Total Asbestos:	2%	
23-02-04376-048	48		White Granular; White Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-049	49		White Granular; White Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-050	50		White Granular; White Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-051	51		White Granular; White Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-052	52		White Granular; White Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-053	53		White Granular; White Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 38-1916 Report Number: 23-02-04376

Project/Test Address: Reedsport Community Charter School;
2260 Longwood Dr

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-054	54		White Granular; White Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-055A	55	Tile	Green Vinyl; Homogeneous	4% Chrysotile	96% Non-Fibrous
			Total Asbestos:	4%	
23-02-04376-055B	55	Mastic	Black Adhesive; Homogeneous	2% Chrysotile	98% Non-Fibrous
			Total Asbestos:	2%	
23-02-04376-056A	56	Tile	Green Vinyl; Homogeneous	4% Chrysotile	96% Non-Fibrous
			Total Asbestos:	4%	
23-02-04376-056B	56	Mastic	Black Adhesive; Homogeneous	2% Chrysotile	98% Non-Fibrous
			Total Asbestos:	2%	
23-02-04376-057	57		White Granular; White Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous
23-02-04376-058	58		White Granular; White Paint-Like; Inhomogeneous	NAD	100% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 38-1916 Report Number: 23-02-04376

Project/Test Address: Reedsport Community Charter School;
2260 Longwood Dr

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-02-04376-059	59		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous
23-02-04376-060	60		Brown Fibrous; White Paint-Like; Inhomogeneous	NAD	98% Cellulose 2% Non-Fibrous

QC Sample: 56-M12012-2

QC Blank: SRM 1866 Fiberglass

Reporting Limit: 1% Asbestos

Method: EPA Method 600/R-93/116, EPA Method 600/M4-82-020

Analyst: Kathy Fletcher

Reviewed By Authorized Signatory: Tasha Eaddy

Tasha Eaddy
QA/QC Clerk

These results are based on a comparative visual estimate. The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Each distinct component in an inhomogeneous sample was analyzed separately and reported as a composite. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C. California Certification #2319 NY ELAP #11714 NVLAP #101882-0 VELAP 460172. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy (TEM), (for enhanced detection capabilities) for materials regulated by EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

400 Point Count Analysis, where noted, performed per EPA Method 600/R-93/116 with a Reporting Limit of 0.25%.

* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND: NAD = no asbestos detected

ENVIRONMENTAL HAZARDS SERVICES, LLC

Asbestos Chain of Custody Form

Company Name	Environmental Hazard Services Pro LLC	Account #	
Company Address	430 N First St.	City/State/Zip	Carlton, Oregon 97111
Phone	(503) 944-9818	Email	Charles_a_spear@yahoo.com
Project Name/Test Address	Reedsport Community Charter School; 2260 Longwood Dr.		
PO Number		Collected By	Matthew C. Spear
Turn-Around Time	○ 5 Day ◉ 3 Day ○ 2 Day ○ 1 Day ○ Same Day / Weekend - Must Call Ahead		

☐ PLM New York Protocol ☐ PLM New Jersey Protocol ☐ PLM South Carolina Protocol

LAB NUMBER	Client Sample ID	Homogeneous Area	Positive Stop	Collection Date & Time	BULK				AIR						COMMENTS
					PLM	Point Count 400	Point Count 1000	TEM Bulk	PCM	TEM AHERA	NIOSH 7402	Time In Total Minutes	Flow Rate In L/Min	Volume In Total Liters	
1	1	X		2/17/23; 3:00pm	X										
2	2	X		2/17/23; 3:00pm	X										
3	3	X		2/17/23; 3:00pm	X										
4	4	X		2/17/23; 3:00pm	X										
5	5	X		2/17/23; 3:00pm	X										
6	6	X		2/17/23; 3:00pm	X										
7	7	X		2/17/23; 3:00pm	X										
8	8	X		2/17/23; 3:00pm	X										
9	9	X		2/17/23; 3:00pm	X										
10	10	X		2/17/23; 3:00pm	X										
11	11	X		2/17/23; 3:00pm	X										
12	12	X		2/17/23; 3:00pm	X										
13	13	X		2/17/23; 3:00pm	X										
14	14	X		2/17/23; 3:00pm	X										
15	15	X		2/17/23; 3:00pm	X										

Released By:	Matthew Spear	Date:	2/17/2023	Time:	5:00pm
Signature:	Matthew C. Spear				

LAB USE ONLY – BELOW THIS LINE

Received By: A Swart

Signature: A Swart

Date: 2 / 27 / 23 Time: 10:52 ☒ AM ☐ PM

☐ Portal Contact Added

23-02-04376

Due Date:
03/01/2023
(Wednesday)
AE

KF

60 PLM

7469 WHITEPINE RD, RICHMOND, VA 23237 (800)-347-4010

RESULTS VIA CLIENT PORTAL AVAILABLE @ www.leadlab.com

ENVIRONMENTAL HAZARDS SERVICES, LLC

Asbestos Chain of Custody Form

LAB NUMBER	Client Sample ID	Homogeneous Area	Positive Stop	Collection Date & Time	BULK				AIR						COMMENTS
					PLM	Point Count 400	Point Count 1000	TEM Bulk	PCM	TEM AHERA	NIOSH 7402	Time In Total Minutes	Flow Rate In L/Min	Volume In Total Liters	
16	16	X		2/17/23; 3:00pm	X										
17	17	X		2/17/23; 3:00pm	X										
18	18	X		2/17/23; 3:00pm	X										
19	19	X		2/17/23; 3:00pm	X										
20	20	X		2/17/23; 3:00pm	X										
21	21	X		2/17/23; 3:00pm	X										
22	22	X		2/17/23; 3:00pm	X										
23	23	X		2/17/23; 3:00pm	X										
24	24	X		2/17/23; 3:00pm	X										
25	25	X		2/17/23; 3:00pm	X										
26	26	X		2/17/23; 3:00pm	X										
27	27	X		2/17/23; 3:00pm	X										
28	28	X		2/17/23; 3:00pm	X										
29	29	X		2/17/23; 3:00pm	X										
30	30	X		2/17/23; 3:00pm	X										
31	31	X		2/17/23; 3:00pm	X										
32	32	X		2/17/23; 3:00pm	X										
33	33	X		2/17/23; 3:00pm	X										
34	34	X		2/17/23; 3:00pm	X										
35	35	X		2/17/23; 3:00pm	X										
36	36	X		2/17/23; 3:00pm	X										
37	37	X		2/17/23; 3:00pm	X										
38	38	X		2/17/23; 3:00pm	X										
39	39	X		2/17/23; 3:00pm	X										
40	40	X		2/17/23; 3:00pm	X										
41	41	X		2/17/23; 3:00pm	X										
42	42	X		2/17/23; 3:00pm	X										
43	43	X		2/17/23; 3:00pm	X										
44	44	X		2/17/23; 3:00pm	X										
45	45	X		2/17/23; 3:00pm	X										

Received By: A Swart

Signature: A Swart

EHS Order #: 14376

Date: 2 / 27 / 23 Time: 10:52 (AM) PM

ENVIRONMENTAL HAZARDS SERVICES, LLC

Asbestos Chain of Custody Form

LAB NUMBER	Client Sample ID	Homogeneous Area	Positive Stop	Collection Date & Time	BULK				AIR						COMMENTS
					PLM	Point Count 400	Point Count 1000	TEM Bulk	PCM	TEM AHERA	NIOSH 7402	Time In Total Minutes	Flow Rate In L/Min	Volume In Total Liters	
46	46	X		2/17/23; 3:00pm	X										
47	47	X		2/17/23; 3:00pm	X										
48	48	X		2/17/23; 3:00pm	X										
49	49	X		2/17/23; 3:00pm	X										
50	50	X		2/17/23; 3:00pm	X										
51	51	X		2/17/23; 3:00pm	X										
52	52	X		2/17/23; 3:00pm	X										
53	53	X		2/17/23; 3:00pm	X										
54	54	X		2/17/23; 3:00pm	X										
55	55	X		2/17/23; 3:00pm	X										
56	56	X		2/17/23; 3:00pm	X										
57	57	X		2/17/23; 3:00pm	X										
58	58	X		2/17/23; 3:00pm	X										
59	59	X		2/17/23; 3:00pm	X										
60	60	X		2/17/23; 3:00pm	X										
61															
62															
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74															
75															

Received By: A. Swart

EHS Order #: 11376

Signature: A Swart

Date: 2 / 27 / 23 Time: 10:52

(AM) PM

APPENDIX 3.0

LEAD PAINT CHAIN-OF-CUSTODY & ANALYTICAL TEST RESULTS

Environmental Hazards Services, L.L.C.
7469 Whitepine Rd
Richmond, VA 23237
Telephone: 800.347.4010

Lead Paint Chip Analysis Report

Report Number: 23-02-04377

Client: Environmental Hazard Services Pro LLC
430 N First Street
Carlton, OR 97111

Received Date: 02/24/2023
Analyzed Date: 02/28/2023
Reported Date: 03/01/2023

Project/Test Address: Reedsport Community Charter School; 2260 Longwood Dr
Collection Date: 02/17/2023

Client Number: 38-1916

Laboratory Results

Fax Number: 503-678-5063

Lab Sample Number	Client Sample Number	Collection Location	Pb (ug/g) ppm	% Pb by Wt.	Narrative ID
23-02-04377-001	PB01	DW WALL	1300	0.13	L04
23-02-04377-002	PB02	DW WALL	1500	0.15	L04
23-02-04377-003	PB03	DW WALL	1900	0.19	L04
23-02-04377-004	PB04	DW WALL	1600	0.16	L04
23-02-04377-005	PB05	DW WALL	1400	0.14	L04

Environmental Hazards Services, L.L.C

Client Number: 38-1916 Report Number: 23-02-04377

Project/Test Address: Reedsport Community Charter School; 2260 Longwood Dr

Lab Sample Number	Client Sample Number	Collection Location	Pb (ug/g) ppm	% Pb by Wt.	Narrative ID

Sample Narratives:

L04: Sample contains substantial amounts of substrate which may affect the calculated results with units of ppm and % by weight.

Preparation Method: ASTM E-1979-17
Analysis Method: EPA SW846 7000B

Reviewed By Authorized Signatory:

Tasha Eaddy
QA/QC Clerk

The Reporting Limit (RL) for samples prepared by ASTM E-1979-17 is 10.0 ug Total Pb. The RL for samples prepared by EPA SW846 3050B is 25.0 ug Total Pb. Paint chip area and results are calculated based on area measurements determined by the client. All internal quality control requirements associated with this batch were met, unless otherwise noted.

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Results represent the analysis of samples submitted by the client. Sample location, description, area, etc., was provided by the client. Results reported above in mg/cm3 are calculated based on area supplied by client. This report shall not be reproduced except in full, without the written consent of Environmental Hazards Services, L.L.C.

ELLAP Accredtitation through AIHA LAP, LLC (100420), NY ELAP #11714.

LEGEND	Pb= lead	ug = microgram	ppm = parts per million
	ug/g = micrograms per gram	Wt. = weight	

ENVIRONMENTAL HAZARDS SERVICES, LLC

Lead Chain of Custody Form

Company Name	Environmental Inspection Services Pro LLC	Account #	
Company Address	430 N First St.	City/State/Zip	Carlton, Oregon 97111
Phone	(503) 944-9818	Email	Charles_a_spear@yahoo.com
Project Name / Testing Address	Reedsport Community Charter School; 2260 Longwood Dr		
PO Number		Collected By	Matthew Spear

Turn-Around Time: ○ 5 Day ◉ 3 Day ○ 2 Day ○ 1 Day ○ Same Day / Weekend - Must Call Ahead

Do Submitted Dust Wipe Samples Meet ASTM E1792 Requirements? ☐ Yes ☐ No

NEW YORK CITY Pb DUST WIPE PROJECTS: Please take floor dust wipe samples using a 2 ft² wipe area.

SAMPLE TYPES				SAMPLE LOCATION ABBREVIATIONS										SURFACE TYPE FOR DUST WIPES			
Dust Wipe	DW	Air	A	Family Room	FR	Front	F	1st FL	1	Bath	BA	Bedroom	BR	Floor	FL	Window Well	WW
Paint Chip	PC	Soil	S	Living Room	LR	Rear	R	2nd FL	2	Dining	DR	Basement	O	Carpet	CP	Window Sill	SL
Composite Soil	CS	Composite Wipe	CW	Den	DN	Left	LT	Right	RT	Kitchen	KT						

LAB NUMBER	Client Sample ID	Collection Date	Sample Type	Collection Location [LR, KT, BA,]	Surface Type	Area: Length X Width (In Inches) [Provide paint chip area only if results are needed in mg/cm²]	Paint Chip: mg/cm²	Paint Chip: % by weight	Air: Total Time [minutes]	Air: Flow Rate [L/min]	Air: Total Volume [Liters]
1	PB01	2/17/2023; 3:00pm	W	DW; Wall	W	X		X			
2	PB02	2/17/2023; 3:00pm	W	DW; Wall	W	X		X			
3	PB03	2/17/2023; 3:00pm	W	DW; Wall	W	X		X			
4	PB04	2/17/2023; 3:00pm	W	DW; Wall	W	X		X			
5	PB05	2/17/2023; 3:00pm	W	DW; Wall	W	X		X			
6						X					
7						X					
8						X					
9						X					
10						X					
11						X					
12						X					
13						X					
14						X					

Released By:	Matthew Spear	Date:	2/17/23	Time:	5:00pm
Signature:	M. Spear				

LAB USE ONLY – BELOW THIS LINE

Received By: A Swart

Signature: A Swart

Date: 2 / 27 / 23 Time: 10 : 40 ☒ AM ☐ PM

☐ Portal Contact Added

23-02-04377

Due Date: 03/01/2023 (Wednesday) AE

APPENDIX 4.0

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY ASBESTOS REGULATIONS

OFFICE OF THE SECRETARY OF STATE
DENNIS RICHARDSON
SECRETARY OF STATE

LESLIE CUMMINGS
DEPUTY SECRETARY OF STATE

ARCHIVES DIVISION
MARY BETH HERKERT
DIRECTOR

800 SUMMER STREET NE
SALEM, OR 97310
503-373-0701

PERMANENT ADMINISTRATIVE ORDER

DEQ 195-2018
CHAPTER 340
DEPARTMENT OF ENVIRONMENTAL QUALITY

FILED
11/15/2018 2:49 PM
ARCHIVES DIVISION
SECRETARY OF STATE
& LEGISLATIVE COUNSEL

FILING CAPTION: Asbestos 2018

EFFECTIVE DATE: 11/15/2018

AGENCY APPROVED DATE: 11/15/2018

CONTACT: Emil Hnidey
503-229-5946
hnidey.emil@deq.state.or.us

700 NE Multnomah St.
Suite 600
Portland,OR 97232

Filed By:
Emil Hnidey
Rules Coordinator

RULES:
340-248-0005, 340-248-0010, 340-248-0100, 340-248-0110, 340-248-0120, 340-248-0130, 340-248-0140, 340-248-0150, 340-248-0160, 340-248-0170, 340-248-0180, 340-248-0205, 340-248-0210, 340-248-0220, 340-248-0230, 340-248-0240, 340-248-0250, 340-248-0260, 340-248-0270, 340-248-0275, 340-248-0280, 340-248-0290

AMEND: 340-248-0005

RULE TITLE: Applicability

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Updated OARs in this section.

RULE TEXT:
OAR 340-248-0010 through 340-248-0280 apply to asbestos milling, manufacturing, fabricating, abatement, and disposal, or any situation where a potential for exposure to asbestos fibers exists.

STATUTORY/OTHER AUTHORITY: ORS 468.020, 468A.025, 468A.135, 468A.745

STATUTES/OTHER IMPLEMENTED: ORS 468A.700 - 468A.760

AMEND: 340-248-0010

RULE TITLE: Definitions

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Added and updated definitions.

RULE TEXT:

The definitions in OAR 340-200-0020 and this rule apply to this division. If the same term is defined in this rule and 340-200-0020, the definition in this rule applies to this division.

(1) "Accredited inspector" means a person who has completed training, received accreditation, and maintains valid accreditation under 40 C.F.R. Part 763 Subpart E, Appendix C (Model Accreditation Plan), Section B (Initial Training), Subsection 3 (Inspector).

(2) "Accredited trainer" means a provider of asbestos abatement training courses authorized by DEQ to offer training courses that satisfy requirements for worker and supervisor training.

(3) "Adequately wet" means to sufficiently mix or penetrate asbestos-containing material or asbestos-containing waste material with liquid to prevent the release of particulate asbestos materials. An asbestos-containing material or asbestos-containing waste material is not adequately wetted if visible emissions originate from that material. Precipitation is not an appropriate method for wetting asbestos-containing material or asbestos-containing waste material.

(4) "Agent" means an individual who works on an asbestos abatement project for a contractor but is not an employee of the contractor.

(5) "Asbestos" means the asbestiform varieties of serpentine (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite (amosite), anthophyllite, actinolite, and tremolite.

(6) "Asbestos abatement project" means a demolition, renovation, repair, construction, or maintenance activity of a facility that involves the repair, enclosure, encapsulation, removal, salvage, handling, or disposal of asbestos-containing material with the potential of releasing asbestos fibers from asbestos-containing material into the air.

(7) "Asbestos manufacturing operation" means the combining of commercial asbestos, or in the case of woven friction products, the combining of textiles containing commercial asbestos, with other material including commercial asbestos, and the processing of this combination into a product as specified in OAR 340-248-0210(3).

(8) "Asbestos-containing material" means a material containing more than one-percent asbestos by weight.

(9) “Asbestos-containing waste material” means waste that contains or is contaminated by asbestos-containing material. Asbestos-containing waste material includes, but is not limited to:

(a) Waste asbestos tailings or commercial asbestos;

(b) Waste generated by a source subject to OAR 340-248-0205 through 340-248-0280;

(c) Filters from control devices;

(d) Bags or containers that previously contained commercial asbestos; and

(e) Asbestos abatement project waste including:

(A) Disposable equipment and clothing;

(B) Material used to establish a negative pressure enclosure;

(C) Demolition or renovation debris;

(D) HEPA filters; and

(E) Other asbestos abatement project waste that cannot be decontaminated.

(10) "Asbestos mill" means a facility engaged in converting, or any intermediate step in converting, asbestos ore into commercial asbestos.

(11) "Asbestos tailings" mean a solid waste product of asbestos mining or milling operations that contains asbestos.

(12) "Asbestos waste generator" means a person performing an asbestos abatement project, the owner or operator of a demolition or renovation activity, or an owner or operator of a source or facility subject to OAR 340-248-0005 through 248-0280 whose act or process generates asbestos-containing waste material.

(13) "Asbestos waste shipment record" means the shipment document, required to be originated and signed by the asbestos waste generator; used to track and substantiate the disposition of asbestos-containing waste material.
(14) "Certified supervisor" means a person who has a current Oregon supervisor certification card.
(15) "Certified worker" means a person who has a current Oregon worker certification card.
(16) "Contractor" means a person that undertakes for compensation an asbestos abatement project for another person. As used in this division, "compensation" means wages, salaries, commissions, and other forms of remuneration paid to a person for personal services.
(17) "Commercial asbestos" means asbestos that is produced by extracting asbestos from asbestos ore.
(18) "Demolition" means wrecking or removing a load-supporting structural member of a facility together with related handling operations or the intentional burning of a facility.
(19) "Fabricating" means processing (e.g., cutting, sawing, drilling) a manufactured product that contains commercial asbestos, with the exception of processing at temporary sites (field fabricating) for the construction or restoration of facilities. In the case of friction products, fabricating includes bonding, debonding, grinding, sawing, drilling, or other similar operations performed as part of fabricating.
(20) "Facility" means all or part of a public or private building, structure, installation, equipment, vehicle, or vessel, including but not limited to ships.
(21) "Friable asbestos material" means asbestos-containing material that when dry can be crumbled, pulverized, or reduced to powder by hand pressure or by the forces expected to act upon the material in the course of demolition, renovation, transportation, or disposal.
(22) “Glove bag” means a sealed compartment with attached inner gloves used for the handling of asbestos-containing materials.
(23) "Grinding" means to reduce to powder or small fragments and includes mechanical chipping or drilling.
(24) "HEPA filter" means a high efficiency particulate air filter capable of filtering 0.3 micron particles with 99.97 percent efficiency.
(25) "In poor condition" means the binding of the material is losing its integrity as indicated by peeling, cracking, or crumbling of the material.
(26) "Inactive asbestos-containing waste disposal site" means a disposal site for asbestos-containing waste where the operator has allowed DEQ’s solid waste permit to lapse, has gone out of business, or no longer receives asbestos-containing waste.
(27) "Interim storage of asbestos-containing waste material" means the storage of asbestos-containing waste material that meets the packaging requirements of this division and has been placed outside a regulated area until transported to a disposal site permitted to receive such waste.
(28) "Installation" means a building or structure or a group of buildings or structures at a single demolition or renovation site that are under the control of the same owner or operator, or under the control of owners or operators of demolition or renovation activities that are under common control.
(29) "Licensed" means a contracting entity has met DEQ’s training and experience requirements to offer and perform asbestos abatement projects and has a current asbestos abatement contractor license. For purposes of this definition, a license is not a permit subject to OAR chapter 340, division 216 or 218.
(30) "Leak-tight" means that neither solids (including dust) nor liquids can escape or spill out.
(31) "Negative pressure enclosure" means a barrier surrounding the area of asbestos abatement comprised of a plastic with a minimum thickness of 6 mil exhausting through a HEPA filter exhaust system measured by an attached and functioning manometer or similar device and resulting in a negative pressure environment of -0.02 inches of water column. The barrier must cover all gaps in the area surrounding the asbestos abatement including doorways, windows, HVAC systems, drains, plumbing, and other gaps.
(32) "Nonfriable asbestos material" means asbestos-containing material that is not friable. When dry, nonfriable asbestos material cannot be crumbled, pulverized, or reduced to powder by hand pressure or by the forces expected to act on the material in the course of demolition, renovation, transportation, or disposal.

(33) "Occupant" means an individual person who lives in a subject private residence.
(34) "Open accumulation" means an accumulation, placement, or storage of friable asbestos material or asbestos-containing waste material other than material securely packaged and stored as required by this division.
(35) "Owner or operator of a demolition or renovation activity" means a person who owns, leases, operates, controls, or supervises the facility undergoing demolition or renovation or a person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.
(36) "Particulate asbestos material" means finely divided particles of asbestos material.
(37) "Person" means an individual, public or private corporation, nonprofit corporation, association, firm, partnership, joint venture, business trust, joint stock company, municipal corporation, political sub-division, the state and an agency of the state, or other entity, public or private, however organized.
(38) "Regulated area" means an area that:
(a) Is established by the person performing an asbestos abatement project;
(b) Includes all areas where asbestos abatement work and associated activities are conducted and an adjoining area where asbestos-containing waste material generated from the project site is securely packaged and stored;
(c) Restricts access to authorized personnel only; and
(d) Is demarcated with prominent warning signs along the perimeter that state, in bold, all-capital letters and separated as shown here:
“DANGER
ASBESTOS
MAY CAUSE CANCER
ASBESTOS CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY”
(39) "Renovation" means altering one or more facility components. Renovation includes replacing, stripping, or repairing facility components, such as mechanical ventilation systems, pipes, ceilings, walls, flooring, and insulating materials. Operations in which load-supporting structural members are wrecked or removed are excluded.
(40) "Residential building" means a facility used as a residence and that is a site-built home, modular home constructed off site, mobile home, condominium, duplex, or a multi-unit facility consisting of four units or less. Exceptions are that residential building does not mean a facility that is:
(a) Used by a fire department for training exercises;
(b) Demolished as part of a larger project including urban renewal projects, highway construction projects, or property developed for commercial use, industrial use, or multi-unit residential buildings with more than four units;
(c) Renovated or demolished along with one or more other facilities on the same site by the same owner or operator of a demolition or renovation activity as part of the same project; or
(d) A residential dwelling unit located in a commercial facility.
(41) "Small-scale, short duration renovating and maintenance activity" means a task for which removing asbestos is not the primary objective of the job, including, but not limited to:
(a) Removing asbestos-containing insulation on pipes;
(b) Removing small quantities of asbestos-insulation on beams or above ceilings;
(c) Replacing an asbestos-containing gasket on a valve;
(d) Installing or removing a small section of drywall; or
(e) Installing electrical conduits through or proximate to asbestos-containing materials.
(42) "Structural member" means a load-supporting member of a facility, such as beams and load-supporting walls; or a non-supporting member, such as ceilings and non-load-supporting walls.
(43) "Training Day" means a day of classroom instruction that consists of at least seven hours of actual classroom instruction and hands-on practice.
(44) "Visible emissions" means emissions that are visually detectable without the aid of instruments.

STATUTORY/OTHER AUTHORITY: ORS 468.020, 468A.025, 468A.135, 468A.745

STATUTES/OTHER IMPLEMENTED: ORS 468A.700 - ORS 468A.760

AMEND: 340-248-0100

RULE TITLE: Licensing and Certification Requirements: Applicability

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Edited for readability and updated statutory authority and statutes implemented

RULE TEXT:

OAR 340-248-0100 through 340-248-0180 provide the requirements, standards, and procedures for contractor licensing, worker and supervisor certification, and asbestos abatement trainer accreditation. These requirements apply to any asbestos abatement project except as provided under OAR 340-248-0250.

STATUTORY/OTHER AUTHORITY: ORS 468.020, 468A.025, 468A.135, 468A.745

STATUTES/OTHER IMPLEMENTED: ORS 468A.700 - ORS 468A.760

AMEND: 340-248-0110

RULE TITLE: Licensing and Certification Requirements: General Provisions

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Added demolition or renovation activity to general provisions and made plain language edits.

RULE TEXT:

(1) Except as provided under OAR 340-248-0250(1)(a) a person performing an asbestos abatement project must be a certified supervisor or worker under OAR 340-248-0130. A certified supervisor may work as a certified worker without having certification as a worker.

(2) An owner or operator of a facility may not allow a person to perform an asbestos abatement project in or on the facility unless the person is certified or licensed under the provisions of this division to perform an asbestos abatement project.

(3) An owner or operator of a demolition or renovation activity may not allow a person to perform an asbestos abatement project as part of the demolition or renovation unless the person is certified or licensed under the provisions of this division to perform an asbestos abatement project.

(4) A contractor that performs an asbestos abatement project must be licensed by DEQ under OAR 340-248-0120.

(5) Except as provided under OAR 340-248-0250(1)(h), a certified supervisor must be present on each asbestos abatement project.

(6) Each training provider for asbestos abatement certification must be accredited by DEQ under OAR 340-248-0140.

(7) Each person DEQ licenses, certifies, or accredits under the provisions of this division must comply with OAR 340-248-0005 through 340-248-0280 and maintain a current address on file with DEQ. DEQ may suspend or revoke the license, certification, or accreditation of any person who does not comply with this section.

(8) DEQ may require training providers to ask applicants to provide their social security number and to retain records of those numbers for DEQ's use in identifying and tracking workers and supervisors. Trainers must notify each applicant that providing their social security number is voluntary and explain how DEQ proposes to use the social security number.

(9) A regional air pollution authority that has been delegated authority under OAR 340-244-0020(2) may inspect for and enforce against violations of licensing and certification regulations. A regional air pollution authority may not approve, deny, suspend or revoke a training provider accreditation, contractor license, or worker certification, but may refer violations to DEQ and recommend denials, suspensions, or revocations.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.707

AMEND: 340-248-0120

RULE TITLE: Licensing and Certification Requirements: Contractor Licensing

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Minor plain language edits and added 60 day notice to renewal requirements.

RULE TEXT:

(1) A contractor must submit an application for a license on a DEQ-approved form and must include the following:

(a) Documentation that the contractor, or the contractor's employee representative, is a certified supervisor;

(b) Certification that the contractor has read and understands the applicable Oregon and federal rules and regulations on asbestos abatement and agrees to comply with the rules and regulations;

(c) A list of all certificates or licenses, issued to the contractor by another jurisdiction, that have been suspended or revoked during the past year, and a list of asbestos-related enforcement actions taken against the contractor during the past year;

(d) A list of additional project supervisors for asbestos abatement projects and their certification numbers;

(e) A summary of all asbestos abatement projects the contractor conducted during the past 12 months; and

(f) A license application fee.

(2) DEQ will review the application for completeness. If the application is incomplete, DEQ will notify the applicant in writing of the deficiencies.

(3) DEQ will deny, in writing, a license to a contractor who has not satisfied the license application requirements.

(4) DEQ will issue a license to the applicant after the license is approved.

(5) A license is valid for a period of 12 months. DEQ may extend the licenses pending DEQ's review of a renewal application if applicant files the renewal application with DEQ no later than 60 days before the expiration date of the contractor's license.

(6) Renewals:

(a) License renewals must be applied for in the same manner as required for the initial license;

(b) For renewal, the contractor or employee representative must have a valid certified supervisor card; and

(c) The applicant must submit the complete renewal application no later than 60 days before the license expiration date.

(7) DEQ may suspend or revoke a license if the licensee:

(a) Fraudulently obtains or attempts to obtain a license;

(b) Fails at any time to satisfy the qualifications for a license;

(c) Fails to meet an applicable state or federal standard relating to asbestos abatement;

(d) Permits an untrained or uncertified worker to work on an asbestos abatement project;

(e) Employs a worker who fails to comply with applicable state or federal rules or regulations relating to asbestos abatement;

(f) Fails to make current certification cards readily available at worksites for inspection by DEQ; or

(g) Fails to pay delinquent application fees, notification fees, or civil penalty assessments.

(8) A contractor whose license has been revoked may reapply for a license after demonstrating to DEQ that the contractor has resolved the cause of the revocation.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.707

AMEND: 340-248-0130

RULE TITLE: Licensing and Certification Requirements: Certification

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Minor plain language edits and updated certification documentation requirements.

RULE TEXT:

(1) Application for Certification -- General Requirements:

(a) A person wishing to become a certified supervisor or relying on prior training, as provided in OAR 340-248-0160 must apply to DEQ, through the training provider, for certification.

(b) A person applying for worker certification without prior training and a certified worker taking a refresher course must apply directly to the accredited training provider using DEQ-approved forms.

(2) An application to be a certified supervisor must include:

(a) Documentation that the applicant has successfully completed the supervisor-level training and examination as specified in OAR 340-248-0150; and

(b) Documentation that the applicant has been certified as a worker and has at least one year of asbestos abatement experience, including time on powered air purifying respirators and experience on at least ten separate friable asbestos abatement projects.

(3) An application to be a certified worker must include documentation that the applicant has successfully completed the level of training and examination as specified in OAR 340-248-0150.

(4) The training course provider will issue a typed certification card and a certificate of course completion to an applicant who has fulfilled the certification requirements.

(5) Certification at all levels is valid for one year after the date of issue.

(6) Annual Recertification:

(a) Previously certified Oregon workers and supervisors must apply through the training provider to take recertification refresher courses;

(b) Applicants for re-certification must possess a valid certification card in order to take the refresher course;

(c) All certified supervisors and workers must complete an annual recertification course during the three months before the expiration date of their certification card. A certified supervisor or worker may reinstate certification by taking the appropriate refresher course up to one year after the expiration date of the current Oregon certification card. After that time, such persons must take the initial course to be recertified.

(7) A current worker certification card must be readily available for inspection by DEQ at each asbestos abatement project for each worker or supervisor engaged in asbestos abatement activities.

(8) Suspensions and Revocations: DEQ may suspend or revoke a person's certification if the person:

(a) Fails to comply with state or federal asbestos abatement regulations;

(b) Performs asbestos removal without physically possessing a current certification card;

(c) Allows one person to use or duplicate another person’s certification card or certificate by another;

(d) Obtains certification from a training provider that does not have DEQ's or the EPA's approval to offer training for the particular discipline; or

(e) Fails to pay delinquent application fees, or civil penalties.

(9) A person whose certification has been revoked may not apply for recertification until 12 months after the revocation date.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468.020, 468A.025

AMEND: 340-248-0140

RULE TITLE: Licensing and Certification Requirements: Training Provider Accreditation

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Made minor plain language edits.

RULE TEXT:

(1) General:

(a) A person may apply to become an Oregon accredited asbestos training provider under this division.

(b) Only training providers DEQ accredits may offer training in Oregon to satisfy the certification requirements contained in this division.

(c) DEQ will accredit each individual training course.

(d) Course instructors must have academic credentials, demonstrated knowledge, prior training, or field experience in their respective training roles.

(e) Training course providers must permit representatives of DEQ or its designee to attend, evaluate and monitor a training course without charge. DEQ is not required to give advance notice of its inspection. DEQ may suspend or withdraw approval of a training course based on the grounds specified in OAR 340-248-0140(4).

(f) All initial worker and supervisor certification training, or initial refresher training involving persons wishing to be certified in Oregon using prior training from an EPA approved accreditation or certification course, must take place in Oregon.

(g) DEQ may require accredited training providers to pay a fee to cover the reasonable travel expenses for one DEQ representative to audit for compliance with this division any accredited refresher course that is not offered in the State of Oregon. This fee is an addition to the standard accreditation application fee.

(2) Application for Accreditation:

(a) Applicants must submit applications for accreditation to DEQ in writing on forms DEQ provides and include the information this section requires:

(A) Name, address, telephone number of the firm, individual, or sponsor conducting the course, including the name under which the training provider intends to conduct the training;

(B) The type of course for which the applicant requests approval;

(C) A detailed course outline showing topics covered and the amount of time given to each topic, and that includes: working with asbestos-substitute materials, fitting and using respirators, use of glove bag, donning protective clothing, constructing a decontamination unit, the number of students to be accommodated, the number of instructors, and the amount of time for hands-on skill training;

(D) A copy of the course manual, instructor notebooks and all printed material to be distributed in the course;

(E) A description of teaching methods to be employed, including description of audio-visual materials to be used. Upon DEQ's request the applicant must provide copies of the materials. Audio-visual materials provided to DEQ will be returned to the applicant;

(F) A description of the hands-on facility to be utilized including protocol for instruction;

(G) A description of the equipment that will be used during classroom lectures and hands-on training;

(H) A list of all personnel involved in course preparation and presentation and a description of the background, special training and qualification of each, as well as the subject matter covered by each;

(I) A copy of each written examination to be given including the scoring methodology to be used in grading the examination; and a detailed statement about the development and validation of the examination;

(J) A list of the tuition or other fees required;

(K) A sample of the certificate of completion;

(L) A description of the procedures and policies for re-examining students who do not successfully complete the training course examination;

(M) A list of a state or accrediting system that approve the training course;

(N) A description of student evaluation methods (other than written examination to be used) associated with the hands-on skill training and course evaluation methods students use;
(O) Restrictions on attendance such as class size, language, affiliation, or target audience of class;
(P) A description of the procedure for issuing replacement certification cards to workers who were issued a certification card by the training provider within the previous 12 months and whose cards have been lost or destroyed;
(Q) Additional information or documentation DEQ may require in order to evaluate the adequacy of the application; and
(R) The accreditation application fee.
(b) The training provider must retain a copy of the application materials listed above for at least three years. The applicant must make such applications available for inspection by DEQ or its designees upon request.
(c) An applicant must submit the application for initial training course accreditation and course materials to DEQ at least 45 days before the requested approval date.
(d) Upon approval of an initial or refresher asbestos training course, DEQ will issue a certificate of accreditation. The certificate is valid for one year from the date of issuance.
(e) Application for renewal of accreditation must follow the procedures described for the initial accreditation. In addition, course instructors must demonstrate that they have maintained proficiency in their instructional specialty and adult training methods during the 12 months before renewal.
(3) Training Provider Administrative Tasks. Accredited training providers must perform the following as a condition of accreditation:
(a) Administer the training course only to those persons who DEQ has approved, or have surrendered their expired certification cards to the trainer and others who are otherwise qualified according to these rules. Such persons may take the examination to complete the training course.
(b) Issue a numbered certificate and a photo certification card to each student who successfully passes the training course examination and meets all other requirements for certification. Each certificate and photo certification card must include:
(A) A unique certificate number;
(B) Name of certified person;
(C) Training course completed;
(D) Dates of the training course;
(E) Date of the examination;
(F) An expiration date of one year after the date upon which the person successfully completed the course and examination;
(G) The name, address, and telephone number of the training provider that issued the certificate; and
(H) A statement that the person receiving the certificate has completed the requisite training for asbestos certification as specified in OAR-340-248-0130.
(c) Provide DEQ with advance payment for each certificate to be issued.
(d) Utilize and distribute to all class participants, as part of the course information, training aides DEQ furnishes.
(e) Provide DEQ with a monthly class schedule at least one week before the schedule begins. Notification must include time and location of each course. Training providers must obtain DEQ approval before starting or offering a class that is not on the provider's monthly schedule, and if the trainer wishes to hold a class with less than one week advanced notice.
(f) Training Providers must comply with the following recordkeeping requirements:
(A) Maintain the training records required by this subsection for a minimum of three years and make them readily available for inspection by DEQ or its designee.
(B) Retain copies of all instructional materials used during each classroom course.
(C) Retain copies of all instructor resumes and instructor approvals issued by either DEQ or US EPA.
(D) Document the following information for each accredited course:
(i) The date the exam was given;

(ii) Training course for which the exam was given;
(iii) The exam proctor's name;
(iv) The name and score of each person taking the exam and a single copy of the exam;
(v) Attendance record;
(vi) Course evaluation form; and
(vii) The names of the instructors for each part of the course offered.
(E) Maintain records of certificates issued to students, including the following information:
(i) Name, address, telephone number, social security number of person receiving the certificate;
(ii) Certificate number given to each person;
(iii) Photograph of each person;
(iv) Discipline for which the certificate was given; and
(v) Dates of training and certificate expiration.
(F) If a training provider is not accredited or ceases to give asbestos worker certification training, the training provider must notify and allow DEQ to take possession of the records for lawful disposition.
(G) Submit certification class information to DEQ within 30 days after the end of each training class or as DEQ directs.
(g) Notify DEQ before issuing a replacement certification card.
(h) Have a current accreditation certificate at the training location.
(4) Denial, Suspension or Revocation of Accreditation. DEQ may deny, suspend, or revoke an application or current accreditation for any of the reasons contained in this section. DEQ will issue a notice of denial, suspension, or revocation specifying the reasons for the action and conditions the applicant must meet before the certificate will be issued or reinstated. Applicants may appeal the Director's determination by requesting a contested case hearing under to the provisions of OAR chapter 340 division 11. DEQ considers the following as grounds for denial, revocation or suspension:
(a) Misrepresenting the extent of a training course's approval by a State or the EPA;
(b) Failing to submit required information or notifications in a timely manner;
(c) Failing to report to DEQ a change in staff or program that substantially deviates from the information contained in the application;
(d) Failing to maintain requisite records;
(e) Falsifying accreditation records, instructor qualifications, or other accreditation information;
(f) Failing to adhere to this division's training standards and requirements;
(g) Failing to comply with this division's administrative tasks and other requirement;
(h) Providing concurrent training for either initial or refresher courses for supervisors and asbestos workers;
(i) Failing to pay delinquent application fees, notification fees, or civil penalties; or
(j) An approved training course instructor or other person with supervisory authority over the training who violates other asbestos regulations administered by DEQ, EPA, or other government agency.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468.020, 468A.025

AMEND: 340-248-0150

RULE TITLE: Licensing and Certification Requirements: General Training Standards

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Specified that training be performed by a DEQ accredited training provider. Made minor plain language edits.

RULE TEXT:

(1) The training provider must limit each class to a maximum of 25 participants unless DEQ grants an exception in writing. The student to instructor ratio for hands-on training must be equal to or less than ten to one (10:1). To apply for an exception allowing class size to exceed 25, the course sponsor must submit the following information in writing to DEQ and receive approval before expanding the class size:

(a) The new class size limit;

(b) The teaching methods and techniques for training the proposed larger class;

(c) The protocol for conducting the written examination; and

(d) Justification for a larger class size.

(2) Course instructors must have academic credentials, demonstrated knowledge, prior training, or field experience in their respective training roles.

(3) DEQ may require an accredited training provider to use examinations DEQ developed in lieu of the examinations the training provider offers.

(4) Courses of instruction required for certification must be specific for each of the certificate categories and must be comply with DEQ's requirements. The provider must present course instruction through a combination of lectures, demonstrations, and hands-on practice.

(5) Courses requiring hands-on training must provide participants actual experience performing tasks associated with asbestos abatement. Demonstrations not involving individual participation are unacceptable as a substitute for hands-on training.

(6) A person seeking certification as a supervisor must successfully complete an accredited training course of at least five training days by a DEQ accredited training provider. The training course must include lectures, demonstrations, at least 14 hours of hands-on training, individual respirator fit testing, course review, and a written examination consisting of multiple choice questions. To successfully complete the course, the candidate must attend the lectures and demonstrations, fully participate in the hands-on training, and achieve a passing score on the closed book examination.

(7) A person seeking certification as a worker must successfully complete an accredited training course of at least four training days by a DEQ accredited training provider. The training course must include lectures, demonstrations, at least 14 hours of actual hands-on training, individual respirator fit testing, course review, and an examination of multiple choice questions. To successfully complete the course, the candidate must attend the lectures and demonstrations, fully participate in the hands-on training, and achieve a passing score on the closed book examination.

(8) Refresher training consists of one training day for certified supervisors and workers. The refresher courses must include a review of key areas of initial training and updates. To successfully complete the course, the candidate must attend the course, fully participate in hands-on training, and achieve a passing score on the closed book examination.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.745

AMEND: 340-248-0160

RULE TITLE: Licensing and Certification Requirements: Prior Training

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Made minor plain language edits.

RULE TEXT:

A candidate may rely on successfully completing a training course accredited by a governmental agency other than DEQ to satisfy the training and examination requirements of OAR 340-248-0130 and 340-248-0140 if all of the following conditions are met:

(1) DEQ determines that the course and examination requirements are equivalent to or exceed the requirements of OAR 340-248-0130 and 340-248-0140 for the level of certification sought or DEQ has a reciprocity agreement with the other jurisdiction.

(2) To qualify for a refresher course and certification, an applicant must have completed prior training during the two years preceding the date the applicant applies to DEQ. Applicants must have a current certification from EPA or an equivalent certification from another state when applying under this section.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.745

AMEND: 340-248-0170

RULE TITLE: Licensing and Certification Requirements: Reciprocity

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Made minor plain language edits.

RULE TEXT:

DEQ may develop reciprocity agreements with other jurisdictions regarding all activities under this division.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.745

AMEND: 340-248-0180

RULE TITLE: Licensing and Certification Requirements: Fees

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Made minor plain language edits.

RULE TEXT:

(1) DEQ may assess the following fees to provide revenues to operate the asbestos control program.

(a) Contractor Licenses: A non-refundable license application fee of $1000 for a one-year Asbestos Abatement Contractor license;

(b) Worker and Supervisor Certifications: A non-refundable application fee of $65 for a one-year certification as an asbestos supervisor and $45 for a one-year certification as an asbestos worker;

(c) Training Provider Accreditation: A non-refundable accreditation application fee of:

(A) $320 for a one-year accreditation to provide a course for training asbestos supervisors;

(B) $320 for a one-year accreditation to provide a course for training asbestos workers; and

(C) $320 each for a one-year accreditation to provide a course for refresher training for Oregon asbestos certification.

(d) Asbestos Abatement Project Notification fee required under OAR 340-248-0260.

(2) Requests for waiver of fees must be made in writing to the Director, on a case-by-case basis, and be based upon financial hardship. Applicants for waivers must describe the reason for the request and certify financial hardship. The Director may waive part or all of a fee.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.745

AMEND: 340-248-0205

RULE TITLE: Emission Standards and Procedural Requirements: General Provisions

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Updated the method to be used when determining asbestos-containing material.

RULE TEXT:

(1) A person may not openly accumulate friable asbestos material or asbestos-containing waste material.

(2) Contractors working on asbestos abatement projects at secure facilities must ensure that all security clearance requirements are completed before asbestos abatement projects at secure facilities start so that DEQ inspectors may gain immediate access to perform required asbestos project inspections.

(3) A person may not sand, grind, saw, or abrade asbestos-containing material unless during such activity the material is handled and disposed of as friable asbestos material as this division provides.

(4) The content of asbestos in asbestos-containing material must be determined using the method specified by the Environmental Protection Agency as listed in EPA/600/R-93/116, July 1993, "Method for the Determination of Asbestos in Bulk Building Materials" or another substantially similar method approved by DEQ. Bulk samples must not be composited for analysis.

STATUTORY/OTHER AUTHORITY: ORS 468.020, 468A.025, 468A.135, 468A.745

STATUTES/OTHER IMPLEMENTED: ORS 468A.700 - 468A.760

United States
Environmental Protection
Agency

Office of Research and
Development
Washington, DC 20460

EPA/600/R-93/116
July 1993

EPA

Test Method

Method for the Determination of Asbestos in Bulk Building Materials

EPA/600/R-93/116
July 1993

TEST METHOD

METHOD FOR THE DETERMINATION OF ASBESTOS IN BULK BUILDING MATERIALS

by

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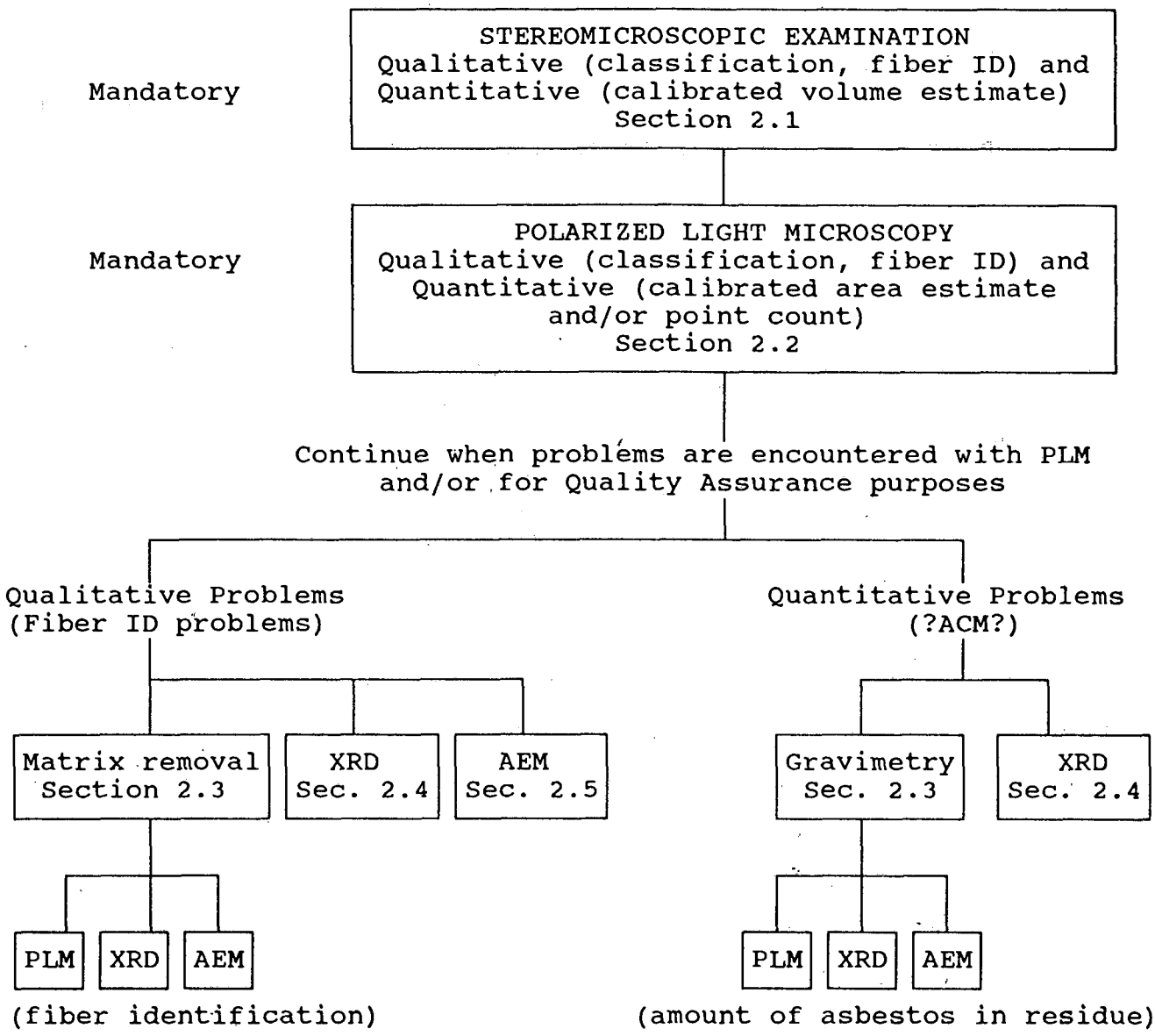
1.0 INTRODUCTION

Laboratories are now called upon to identify asbestos in a variety of bulk building materials, including loose-fill insulations, acoustic and thermal sprays, pipe and boiler wraps, plasters, paints, flooring products, roofing materials and cementitious products.

The diversity of bulk materials necessitates the use of several different methods of sample preparation and analysis. An analysis with a simple stereomicroscope is always followed by a polarized light microscopic (PLM) analysis. The results of these analyses are generally sufficient for identification and quantitation of major concentrations of asbestos. However, during these stereomicroscopic and PLM analyses, it may be found that additional techniques are needed to: 1) attain a positive identification of asbestos; 2) attain a reasonable accuracy for the quantity of asbestos in the sample; or 3) perform quality assurance activities to characterize a laboratory's performance. The additional techniques include x-ray diffraction (XRD), analytical electron microscopy (AEM), and gravimetry, for which there are sections included in the method. Other techniques will be considered by the Environmental Protection Agency (EPA) and may be added at some future time. Table 1-1 presents a simplified flowchart for analysis of bulk materials.

This Method for the Determination of Asbestos in Bulk Building Materials outlines the applicability of the various preparation and analysis methods to the broad spectrum of bulk building materials now being analyzed. This method has been evaluated by the EPA Atmospheric Research and Exposure Assessment Laboratory (EPA/AREAL) to determine if it offers improvements to current analytical techniques for building materials. This method demonstrated a capability for improving the precision and accuracy of analytical results. It contains significant revisions to procedures outlined in the Interim Method,[1] along with the addition of several new procedures. Each technique may reduce or introduce bias, or have some effect on the precision of the measurement, therefore results need to be interpreted judiciously. Data on each technique, especially those new to asbestos analysis, will be collected over time and carefully evaluated, with resulting recommendations for changes to the Method to be passed on to the appropriate program office within EPA.

TABLE 1-1. SIMPLIFIED FLOWCHART FOR ANALYSIS OF BULK MATERIALS



This is an analytical method. It is not intended to cover bulk material sampling, an area addressed previously[2,3,4,5] by the EPA. However, subsampling or sample splitting as it pertains to laboratory analysis procedures in this method, is discussed throughout.

1.1 References

1. **Interim Method for the Determination of Asbestos in Bulk Insulation Samples,** U.S. E.P.A. 600/M4-82-020, 1982.
2. **Asbestos-Containing Materials in School Buildings: A Guidance Document,** Part 1 and 2, U.S. E.P.A./O.T.S NO. C00090, 1979.
3. **Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Materials,** U.S. E.P.A. 560/5-85-030a, 1985.
4. **Guidance for Controlling Asbestos-Containing Materials in Buildings,** U.S. E.P.A. 560/5-85-024, 1985.
5. **Asbestos-Containing Materials in Schools: Final Rule and Notice,** 40 CFR Part 763, October, 1987.

2.0 METHODS

2.1 Stereomicroscopic Examination

A preliminary visual examination using a simple stereomicroscope is mandatory for all samples. A sample should be of sufficient size to provide for an adequate examination. For many samples, observations on homogeneity, preliminary fiber identification and semi-quantitation of constituents can be made at this point. Another method of identification and semi-quantitation of asbestos must be used in conjunction with the stereomicroscopic examination. A description of the suggested apparatus needed for stereomicroscopic examination is given in Appendix B.

The laboratory should note any samples of insufficient volume. A sufficient sample volume is sample-type dependent. For samples such as floor tiles, roofing felts, paper insulation, etc., three to four square inches of the layered material would be a preferred sample size. For materials such as ceiling tiles, loose-fill insulation, pipe insulation, etc., a sample size of approximately one cubic inch ($\sim$ 15cc) would be preferred. For samples of thin-coating materials such as paints, mastics, spray plasters, tapes, etc., a smaller sample

size may be suitable for analysis. Generally, samples of insufficient volume **should be rejected**, and further analysis curtailed until the client is contacted. The quantity of sample affects the sensitivity of the analysis and reliability of the quantitation steps. If there is a question whether the sample is representative due to inhomogeneity, the sample should be rejected, at least until contacting the client to see if: 1) the client can provide more material or 2) the client wishes the laboratory to go ahead with the analysis, but with the laboratory including a statement on the limited sensitivity and reliability of quantitation. If the latter is the case, the report of analysis should state that the client was contacted, that the client decided that the lab should use less material than recommended by the method, and that the client acknowledges that this may have limited the sensitivity and quantitation of the method. At the time the client is contacted about the material, he or she should be informed that a statement reflecting these facts will be placed in the report.

2.1.1 Applicability

Stereomicroscopic analysis is applicable to all samples, although its use with vinyl floor tile, asphaltic products, etc., may be limited because of small asbestos fiber size and/or the presence of interfering components. It does not provide positive identification of asbestos.

2.1.2 Range

Asbestos may be detected at concentrations less than one percent by volume, but this detection is highly material dependent.

2.1.3 Interferences

Detection of possible asbestos fibers may be made more difficult by the presence of other nonasbestos fibrous components such as cellulose, fiber glass, etc., by binder/matrix materials which may mask or obscure fibrous components, and/or by exposure to conditions (acid environment, high temperature, etc.) capable of altering or transforming asbestos.

2.1.4 Precision and Accuracy

The precision and accuracy of these estimations are material dependent and must be determined by the individual laboratory for the percent range involved. These values may be

determined for an individual analyst by the in-house preparation and analysis of standards and the use of error bars, control charts, etc.

The labs should also compare to National Voluntary Laboratory Accreditation Program (NVLAP) proficiency testing samples, if the lab participates in the Bulk Asbestos NVLAP, or to external quality assurance system consensus results such as from proficiency testing programs using characterized materials. However, at this time, consensus values for the quantity of asbestos have been shown to be unreliable. Only proficiency testing materials characterized by multiple techniques should be used to determine accuracy and precision.

2.1.5 Procedures

NOTE: Exposure to airborne asbestos fibers is a health hazard. Bulk samples submitted for analysis are oftentimes friable and may release fibers during handling or matrix reduction steps. All sample handling and examination must be carried out in a HEPA-filtered hood, a class 1 biohazard hood or a glove box with continuous airflow (negative pressure). Handling of samples without these precautions may result in exposure of the analyst to and contamination of samples by airborne fibers.

2.1.5.1 Sample Preparation

No sample preparation should be undertaken before initial stereomicroscopic examination. Distinct changes in texture or color on a stereomicroscopic scale that might denote an uneven distribution of components should be noted. When a sample consists of two or more distinct layers or building materials, each should be treated as a separate sample, when possible. Thin coatings of paint, rust, mastic, etc., that cannot be separated from the sample without compromising the layer are an exception to this case and may be included with the layer to which they are attached. Drying (by heat lamp, warm plate, etc.) of wet or damp samples is recommended before further stereomicroscopic examination and is mandatory before PLM examination. **Drying must be done in a safety hood.**

For nonlayered materials that are heterogeneous, homogenization by some means (mill, blender, mortar and pestle) may provide a more even distribution of sample components. It

may also facilitate disaggregation of clumps and removal of binder from fibers (rarely however, it may mask fibers that were originally discernable).

For materials such as cementitious products and floor tiles, breaking, pulverizing, or grinding may improve the likelihood of exposing fibrous components.

It may be appropriate to treat some materials by dissolution with hydrochloric acid to remove binder/matrix materials. Components such as calcite, gypsum, magnesite, etc., may be removed by this method. For materials found to possess a high organic content (cellulose, organic binders), ashing by means of a muffle furnace or plasma asher (for small, cellulosic samples), or dissolution by solvents may be used to remove interfering material. In either case, it is recommended that matrix removal be tracked gravimetrically.

Additional information concerning homogenization, ashing and acid dissolution may be found in Sections 2.2.5.1 and 2.3.

2.1.5.2 Analysis

Samples should be examined with a simple stereomicroscope by viewing multiple fields of view over the entire sample. The whole sample should be observed after placement in a suitable container (watchglass, weigh boat, etc.) substrate. Samples that are very large should be subsampled. The sample should be probed, by turning pieces over and breaking open large clumps. The purpose of the stereomicroscopic analysis is to determine homogeneity, texture, friability, color, and the extent of fibrous components of the sample. This information should then be used as a guide to the selection of further, more definitive qualitative and quantitative asbestos analysis methods. Homogeneity refers to whether each subsample made for other analytical techniques (e.g. the "pinch" mount used for the PLM analysis), is likely to be similar or dissimilar. Color can be used to help determine homogeneity, whether the sample has become wet (rust color), and to help identify or clarify sample labelling confusion between the building material sampler and the laboratory. Texture refers to size, shape and arrangement of sample components. Friability may be indicated by the ease with which the sample is disaggregated (see definitions in Appendix A) as received by the analyst. This does not necessarily represent the friability of the material as determined by the assessor at the collection site. The relative proportion of fibrous

components to binder/matrix material may be determined by comparison to similar materials of known fibrous content. For materials composed of distinct layers or two or more distinct building materials, each layer or distinct building material should be treated as a discrete sample. The relative proportion of each in the sample should be recorded. The layers or materials should then be separated and analyzed individually. Analysis results for each layer or distinct building material should be reported. If monitoring requirements call for one reported value, the results for the individual layers or materials should always be reported along with the combined value. Each layer or material should be checked for homogeneity during the stereomicroscopic analysis to determine the extent of sample preparation and homogenization necessary for successful PLM or other analysis. Fibers and other components should be removed for further qualitative PLM examination.

Using the information from the stereomicroscopic examination, selection of additional preparation and analytical procedures should be made. Stereomicroscopic examination should typically be performed again after any change or major preparation (ashing, acid dissolution, milling, etc.) to the sample. Stereomicroscopic examination for estimation of asbestos content may also be performed again after the qualitative techniques have clarified the identities of the various fibrous components to assist in resolving differences between the initial quantitative estimates made during the stereomicroscopic analysis and those of subsequent techniques. Calibration of analysts by use of materials of known asbestos content is essential.

The stereomicroscopic examination is often an iterative process. Initial examination and estimates of asbestos concentration should be made. The sample should then be analyzed by PLM and possibly other techniques. These results should be compared to the initial stereomicroscopic results. Where necessary, disagreements between results of the techniques should be resolved by reanalyzing the sample stereomicroscopically.

2.1.6 Calibration Materials

Calibration materials fall into several categories, including internal laboratory standards and other materials that have known asbestos weight percent content. These calibration materials could include:

- Actual bulk samples: asbestos-containing materials that have been characterized by other analytical methods such as XRD, AEM and/or gravimetry. (e.g. NVLAP test samples).

- Generated samples: in-house standards that can be prepared by mixing known quantities of asbestos and known quantities of asbestos-free matrix materials (by weight), and mixing (using blender, mill, etc.) thoroughly to achieve homogeneity; matrix materials such as vermiculite, perlite, sand, fiberglass, calcium carbonate, etc. may be used. A range of asbestos concentrations should be prepared (e.g. 1, 3, 5, 10, 20%, etc.). The relationship between specific gravities of the components used in standards should be considered so that weight/volume relationships may be determined.

- Photographs, drawings: photomicrographs of standards, computer-generated drawings, etc.

Suggested techniques for the preparation and use of in-house calibration standards are presented in Appendix C, and at greater length by Harvey et al.[1] The use of synthesized standards for analyst calibration and internal laboratory quality control is not new however, having been outlined by Webber et al.[2] in 1982.

2.1.7 References

1. Harvey, B. W., R. L. Perkins, J. G. Nickerson, A. J. Newland and M. E. Beard, "Formulating Bulk Asbestos Standards", **Asbestos Issues**, April 1991, pp. 22-29.

2. Webber, J. S., A. Pupons and J. M. Fleser, "Quality-Control Testing for Asbestos Analysis with Synthetic Bulk Materials". **American Industrial Hygiene Associations Journal**, 43, 1982, pp. 427-431.

2.2 Polarized Light Microscopy

2.2.1 Principle and Applicability

Samples of bulk building materials taken for asbestos identification should first be examined with the simple stereomicroscope to determine homogeneity and preliminary fiber identification. Subsamples should then be examined using PLM to determine optical properties of constituents and to provide positive identification of suspect fibers.

The principles of optical mineralogy are well-established.[1,2,3,4] A light microscope equipped with two polarizing filters is used to observe specific optical characteristics of a sample. The use of plane polarized light allows for the determination of refractive indices relative to specific crystallographic orientations. Morphology and color are also observed while viewing under plane polarized light. Observation of particles or fibers while oriented between polarizing filters whose privileged vibration directions are perpendicular (crossed polars) allows for determination of isotropism/anisotropism, extinction characteristics of anisotropic particles, and calculation of birefringence. A retardation plate may be placed in the polarized light path for verification of the sign of elongation. If subsamples are prepared in such a way as to represent all sample components and not just suspect fibers, semi-quantitative analysis may also be performed. Semi-quantitative analysis involves the use of calibrated visual area estimation and/or point counting. Visual area estimation is a semi-quantitative method that must relate back to calibration materials. Point counting, also semi-quantitative, is a standard technique used in petrography for determining the relative areas occupied by separate minerals in thin sections of rock. Background information on the use of point counting[3] and the interpretation of point count data[5] is available.

Although PLM analysis is the primary technique used for asbestos determination, it can show significant bias leading to false negatives and false positives for certain types of materials. PLM is limited by the visibility of the asbestos fibers. In some samples the fibers may be reduced to a diameter so small or masked by coatings to such an extent that they cannot be reliably observed or identified using PLM.

2.2.2 Range

The detection limit for visual estimation is a function of the quantity of sample analyzed, the nature of matrix interference, sample preparation, and fiber size and distribution. Asbestos may be detected in concentrations of less than one percent by area if sufficient material is analyzed. Since floor tiles may contain fibers too small to be resolved by PLM ($< 0.25\ \mu m$ in diameter), detection of those fibers by this method may not be possible. When point counting is used, the detection limit is directly proportional to the amount of sample analyzed, but is also limited by fiber visibility. Quantitation by area estimation, both visual and by point counting, should yield similar results if based on calibration standards.

2.2.3 Interferences

Fibrous and nonfibrous, organic and inorganic constituents of bulk samples may interfere with the identification and quantitation of the asbestos mineral content. Binder/matrix materials may coat fibers, affect color, or obscure optical characteristics to the extent of masking fiber identity. Many organic mastics are soluble in refractive index liquids and, unless removed prior to PLM examination, may affect the refractive index measurement of constituent materials. Fine particles of other materials may also adhere to fibers to an extent sufficient to cause confusion in identification. Gravimetric procedures for the removal of interfering materials are presented in Section 2.3.

2.2.4 Precision and Accuracy

Data obtained for samples containing a single asbestos type in a sample matrix have been reported previously by Brantley et al.[6] Data for establishing the accuracy and precision of the method for samples with various matrices have recently become available. Perkins,[7] Webber et al.[8] and Harvey et al.[9] have each documented the tendency for visual estimates to be high when compared to point-count data. Precision and accuracy must be determined by the individual laboratory for the percent range involved. If point counting and/or visual estimates are used, a table of reasonably expanded errors, such as those shown in Table 2-1, should be generated for different concentrations of asbestos.

If the laboratory cannot demonstrate adequate precision and accuracy (documented by control charts, etc), quantitation by additional methods, such as gravimetry, may be required. Refer to the Handbook for SRM Users[10] for additional information concerning the concepts of precision and accuracy.

TABLE 2-1. SUGGESTED ACCEPTABLE ERRORS FOR PLM ANALYSIS
(Based on 400 point counts of a reasonably homogeneous sample or 100 fields of view for visual estimate)

% Area Asbestos	Acceptable Mean Result	% Area Asbestos	Acceptable Mean Result
1	>0-3%	50	40-60%
5	>1-9%	60	50-70%
10	5-15%	70	60-80%
20	10-30%	80	70-90%
30	20-40%	90	80-100%
40	30-50%	100	90-100%

2.2.5 Procedures

NOTE: Exposure to airborne asbestos fibers is a health hazard. Bulk samples submitted for analysis are oftentimes friable and may release fibers during handling or matrix reduction steps. All sample and slide preparations must be carried out in a HEPA-filtered, a class 1 biohazard hood, or a glove box with continuous airflow (negative pressure). Handling of samples without these precautions may result in exposure of the analyst to and contamination of samples by airborne fibers.

2.2.5.1 Sample Preparation

Slide mounts are prepared for the identification and quantitation of asbestos in the sample.

2.2.5.1.1 Qualitative Analysis Preparation

The qualitative preparation must allow the PLM analysis to classify the fibrous components of the sample as asbestos or nonasbestos. The major goal of the qualitative

preparation is to mount easily visible fibers in appropriate refractive index liquids for complete optical characterization. Often this can be accomplished by making immersion grain mounts of random subsamples of the homogeneous material. Immersion liquids with refractive indices close to the suspected (see stereomicroscopic analysis) asbestos mineral should be used for the qualitative analysis so that n_D can be determined. Problem samples include those with inhomogeneities, coatings, small fibers, and interfering compounds. Additional qualitative preparations are often necessary for these types of samples. All samples, but especially those lacking homogeneity, may require picking of fibers from specific sample areas during the stereomicroscopic examination. Coatings on the fibers often need to be removed by mechanical or chemical means. Teasing the particles apart or use of a mortar and pestle or similar mechanical method often is sufficient to free fibers from coatings. Chemical means of removing some coatings and interfering compounds are discussed in Section 2.3, Gravimetry.

2.2.5.1.2 Quantitative Analysis Preparation

The major purpose of the quantitative preparation is to provide the analyst with a representative grain mount of the sample in which the asbestos can be observed and distinguished from the nonasbestos matrix. This is typically performed by using randomly selected subsamples from a homogeneous sample (see stereomicroscopic analysis). Particles should be mounted in a refractive index (RI) liquid that allows the asbestos to be visible and distinguished from nonasbestos components. Care should be taken to ensure proper loading and even distribution of particles. Both the qualitative and quantitative sample preparations are often iterative processes. Initial samples are prepared and analyzed. The PLM analysis may disclose problems or raise questions that can only be resolved by further preparations (e.g. through the use of different RI immersion liquids, elimination of interfering compounds, sample homogenization, etc.)

For layered materials, subsamples should be taken from each individual or discrete layer. Each of these subsamples should be treated as a discrete sample, but as stated in Section 2.1.5.2, the results for the individual layers or materials may be combined if called for by monitoring requirements.

Homogenization involves the use of any of a variety of devices, such as a mortar and pestle, mill, or blender to pulverize, disaggregate and mix heterogeneous, friable bulk materials. Selection of the appropriate device is dependent upon personal preference and the nature of the materials encountered. A blender or mortar and pestle may be adequate for homogenizing materials that lack appreciable amounts of tacky matrix/binder, and for separating interfering components from the fibers. For materials which are unusually sticky or tacky, or contain unusually long asbestos fibers, milling (especially freezer milling) may be more efficient. However, milling should be discontinued as soon as the material being milled appears homogeneous, in order to reduce the potential for mechanically reducing fiber size below the resolving power of the polarizing microscope. Hammer mills or cutting mills may also be used on these materials; however, the same precaution regarding reduction of fiber size should be taken. Blending /milling devices should be disassembled (to the extent possible) and thoroughly cleaned after each use to minimize contamination.

2.2.5.2 Analysis

Analysis of bulk building materials consists of the identification and semi-quantitation of the asbestos type(s) present, along with the identification, where possible, of fibrous nonasbestos materials, mineral components and matrix materials. If the sample is heterogeneous due to the presence of discrete layers or two or more distinct building materials, each layer or distinct material should be analyzed, and results reported. Total asbestos content may also be stated in terms of a relative percentage of the total sample.

2.2.5.2.1 Identification

Positive identification of asbestos requires the determination of the following optical properties:

- Morphology
- Color and, if present, pleochroism
- Refractive indices ($\pm$ .005)
- Birefringence
- Extinction characteristics
- Sign of elongation

Descriptions of the optical properties listed above for asbestos fibers may be found in Appendix A, Glossary of Terms. Table 2-2 lists the above properties for the six types of asbestos and Table 2-3 presents the central stop dispersion staining colors for the asbestos minerals with selected high-dispersion index liquids. Tables 2-4 and 2-5 list selected optical properties of several mineral and man-made fibers. All fibrous materials in amounts greater than trace should be identified as asbestos or nonasbestos, with all optical properties measured for asbestos and at least one optical property measured for each nonasbestos fibrous component that will distinguish each from asbestos. Small fiber size and/or binder may necessitate viewing the sample at higher magnification (400-500x) than routinely used (100x).

Although it is not the purpose of this section to explain the principles of optical mineralogy, some discussion of the determination of refractive indices is warranted due to its importance to the proper identification of the asbestos minerals. Following is a brief discussion of refractive index determination for the asbestos minerals.

All asbestos minerals are anisotropic, meaning that they exhibit different optical properties (including indices of refraction) in different directions. All asbestos minerals are biaxial, meaning that they have one principal refractive index parallel (or nearly parallel) to the length of the fiber and two principal refractive indices (plus all intermediate indices between these two) in the plane perpendicular (or nearly so) to the length of the fiber. Although chrysotile (serpentine) is classified as a biaxial mineral, it behaves as a uniaxial mineral (two principal refractive indices) due to its scrolled structure. Amosite and crocidolite, although also biaxial, exhibit uniaxial properties due to twinning of the crystal structure and/or random orientation of fibrils in a bundle around the long axis of the bundle. For all of the asbestos minerals except crocidolite, the highest refractive index (γ) is aligned with the fiber length (positive sign of elongation). For crocidolite, the lowest refractive index (α) is aligned with the fiber length (negative sign of elongation). A more complete explanation of the relationship of refractive indices to the crystallographic directions of the asbestos minerals may be found in References 1, 2, 4, 11 and 12. It should be noted that for the measurement of refractive indices in an anisotropic particle (e.g. asbestos fibers), the orientation of the particle is quite critical. Orientation with respect to rotation about the axis

of the microscope (and thus with respect to the vibration directions of the polarizer and analyzer) and also to the horizontal plane (plane of the microscope stage) will affect the determination of the correct values for refractive indices. The refractive index that is measured will always correspond to a direction perpendicular to the axis of the microscope (i.e., lying in the plane of the stage) and is the direction in that horizontal plane parallel to the vibration direction of the polarizer, by convention E-W.

To determine $\gamma(n \parallel)$ for chrysotile, anthophyllite and amosite, the index is measured when the length of the fiber is aligned parallel to the vibration direction of the polarizer (E-W). Under crossed polars, the fiber should be at extinction in this orientation. To determine the lowest refractive index, α $(n \perp)$, for chrysotile and amosite, the fiber should be oriented N-S (extinction position under crossed polars). The determination of $n \parallel$ and $n \perp$ with crocidolite is accomplished in the same manner as with amosite and chrysotile with the exception that the α and γ directions are reversed. For crocidolite, α is measured at the E-W position (parallel to the polarizer) and γ is measured at the N-S orientation (perpendicular to the polarizer). For anthophyllite, the fiber should be oriented N-S and the lowest and highest indices for this orientation should be measured. These correspond to α and β respectively.

The extinction behavior of tremolite-actinolite is anomalous compared to that of most monoclinic minerals due to the orientation of the optic axes relative to the crystallographic axes. This relationship is such that the refractive indices of the principal axes α and γ <u>are not measured</u> when the fiber is exhibiting the maximum extinction angle. The values measured at these positions are α' and γ' The fiber exhibits an extinction angle within a few degrees of the maximum throughout most of its rotation. A wide range of refractive indices from α' to α, and from γ' to γ, are observed. For tremolite-actinolite, β is measured on those fibers displaying parallel extinction when oriented in the N-S position. The refractive index for α is also measured when the fiber is oriented generally in the N-S position and exhibits <u>the true extinction</u> angle; true α will be the <u>minimum</u> index. To determine the refractive index for γ, the fibers should be oriented E-W and exhibit the true extinction angle; true γ will be the <u>maximum</u> value for this orientation.

When viewing single fibers, the analyst may often be able to manipulate the microscope slide cover slip and "roll" the fibers to positions that facilitate measuring the true values of refractive indices. When viewing a large population of fibers with the microscope in the dispersion staining mode, the analyst can easily detect fibers that exhibit the highest and lowest indices (β and α) in the N-S position and the highest indices (γ) in the E-W position. Since individual asbestos fibrils cannot generally be resolved using polarized light microscopy, refractive indices are most commonly measured on fiber bundles. Such measurements would not result in true values for the indices and therefore by convention should be reported as α' and γ'.

Asbestos types chrysotile, amosite and crocidolite are currently available as SRM 1866 and actinolite, tremolite and anthophyllite as SRM 1867 from the Office of Standard Reference Materials, National Institute of Standards and Technology.

2.2.5.2.2 Quantitation of Asbestos Content

As described in Sections 2.1.5 and 2.1.6, a calibrated visual volume estimation of the relative concentrations of asbestos and nonasbestos components should be made during the stereomicroscopic examination. In addition, quantitation of asbestos content should be performed on subsample slide mounts using calibrated visual area estimates and/or a point counting procedure. Section 2.1.6 and Appendix C discuss the procedures for preparation and use of calibration standards. After thorough PLM analysis in which the asbestos and other components of the bulk material are identified, several slides should be carefully prepared from randomly selected subsamples. If the sample is not homogeneous, some homogenization procedure should be performed to ensure that slide preparations made from small pinch samples are representative of the total sample. Homogenization may range from gentle mixing using a mortar and pestle to a brief period of mixing using a blender equipped with a mini-sample container. The homogenization should be of short duration ($\sim$ 15 seconds) if using the blender technique so as to preclude a significant reduction in fiber size. The use of large cover slips (22x30mm) allows for large subsamples to be analyzed. Each slide should be checked to ensure that the subsample is representative, uniformly dispersed, and loaded in a way so as not to be dominated by superimposed (overlapping) particles.

During the qualitative analysis of the sample, the analyst should decide on the appropriate optical system (including magnification) to maximize the visibility of the asbestos in the sample while still allowing the asbestos to be uniquely distinguished from the matrix materials. The analyst may choose to alter the mounting medium or the optical system to enhance contrast. During the quantitative analysis, slides should be scanned using an optical setup that yields the best visibility of the asbestos. Upon finding asbestos, the parameters that were selected in the qualitative analysis for uniquely distinguishing it from the matrix should be used for identification. These properties will vary with the sample but include any or all of the parameters required for the qualitative analysis. For instance, low magnification allows for concurrent use of dispersion staining (focal screening), but compromises resolution of extremely small diameter fibers; use of a compensator plate and crossed polarizers frequently enhances the contrast between asbestos fibers and matrix material.

Visual area estimates should be made by comparison of the sample to calibration materials that have similar textures and fiber abundance (see Section 2.1.6 and Appendix C). A minimum of three slide mounts should be examined to determine the asbestos content by visual area estimation. Each slide should be scanned in its entirety and the relative proportions of asbestos and nonasbestos noted. It is suggested that the ratio of asbestos to nonasbestos material be recorded for several fields for each slide and the results be compared to data derived from the analysis of calibration materials having similar textures and asbestos content.

For point counting, an ocular reticle (cross-line or point array) should be used to visually superimpose a point or points on the microscope field of view. The cross-line reticle is preferred. Its use requires the scanning of most, if not all, of the slide area, thereby minimizing bias that might result from lack of homogeneity in the slide preparation. In conjunction with this reticle, a click-stop counting stage can be used to preclude introducing bias during slide advancement. Magnification used will be dictated by fiber visibility. The slide should be examined along multiple parallel traverses that adequately cover the sample area. The analyst should score (count) only points directly over occupied (nonempty) areas. Empty points should not be scored on the basis of the closest particle. If an asbestos fiber and a nonasbestos particle overlap so that a point is superimposed on their visual intersection,

a point should be scored for both categories. If the point(s) is/are superimposed on an area which has several overlapping particles, the slide should be moved to another field. While not including them in the total asbestos points counted, the analyst should record the presence of any asbestos detected but not lying under the reticle cross-line or array points. A minimum of 400 counts (maximum of eight slides with 50 counts each to minimum of two slides with 200 counts each) per sample is suggested, but it should be noted that accuracy and precision improve with number of counts. Point counting provides a determination of the projected area percent asbestos. Conversion of area percent to dry weight percent is not feasible unless the specific gravities and relative volumes of the different materials are known. It should be noted that the total amount of material to be analyzed is dependent on the asbestos concentration, i.e. the lower the concentration of asbestos, the larger the amount of sample that should be analyzed, in both the visual estimation and point counting methods. Quantitation by either method is made more difficult by low asbestos concentration, small fiber size, and presence of interfering materials.

It is suggested that asbestos concentration be reported as volume percent, weight percent or area percent depending on the method of quantitation used. A weight concentration cannot be determined without knowing the relative specific gravities and volumes of the sample components.

Mineral	Morphology and Color[1]	Refractive Indices[2] α	Refractive Indices[2] γ[5]	Birefringence[6]	Extinction	Sign of Elongation
Chrysotile (asbestiform serpentine)	Wavy fibers. Fiber bundles have splayed ends and "kinks". Aspect ratio typically >10:1. Colorless[3]	1.493-1.546 1.532-1.549 1.529-1.559 1.544-1.553	1.517-1.557 1.545-1.556 1.537-1.567 1.552-1.561	0.004-0.017	Parallel	+ (length slow)
Amosite (asbestiform grunerite)	Straight to curved, rigid fibers. Aspect ratio typically >10:1. Colorless to brown, nonpleochroic or weakly so.[4] Opaque inclusions may be present	1.657-1.663 1.663-1.686 1.663-1.686 1.676-1.683	1.699-1.717 1.696-1.729 1.696-1.729 1.697-1.704	0.021-0.054	Usually parallel	+ (length slow)
Crocidolite (asbestiform riebeckite)	Straight to curved, rigid fibers. Aspect ratio typically > 10:1. Thick fibers and bundles common, blue to dark-blue in color. Pleochroic.	1.693 1.654-1.701 1.680-1.698	1.697 1.668-1.717 1.685-1.706	0.003-0.022	Usually parallel	- (length fast)
Anthophyllite-asbestos	Straight to curved fibers and bundles. Aspect ratio typically > 10:1. Anthophyllite cleavage fragments may be present with aspect ratios <10:1. Colorless to light brown.	1.598-1.652 1.596-1.694 1.598-1.674 1.6148[7]	1.623-1.676 1.615-1.722 1.615-1.697 1.6362[7]	0.013-0.028	Parallel	+ (length slow)
Tremolite-Actinolite-asbestos	Straight to curved fibers and bundles. Aspect ratio typically > 10:1. Cleavage fragments may be present with aspect ratios <10:1. Colorless to pale green	Tremolite 1.600-1.628 1.604-1.612 1.599-1.612 1.6063[7]	 1.625-1.655 1.627-1.635 1.625-1.637 1.6343[7]	 0.017-0.028	Parallel and oblique (up to 21°); Composite fibers show parallel extinction.	+ (length slow)
		Actinolite 1.600-1.628 1.612-1.668 1.613-1.628 1.6126[7]	 1.625-1.655 1.635-1.688 1.638-1.655 1.6393[7]	 0.017-0.028		

[1]Colors cited are seen by observation with plane polarized light.

[2]From references 2, 11, 12, and 18, respectively. Refractive indices for n_d at 589.3nm.

[3]Fibers subjected to heating may be brownish. (references 13, 14, and 15)

[4]Fibers subjected to heating may be dark brown and pleochroic. (references 13, 14, and 15)

[5]$\parallel$ to fiber length, except $\perp$ to fiber length for crocidolite only.

[6]Maximum and minimum values from references 2, 11, 12, and 18 given.

[7]$\pm$ 0.0007

TABLE 2-3. TYPICAL CENTRAL STOP DISPERSION STAINING COLORS[1]

Mineral	Cargille® RI Liquid	n‖	n⊥
Chrysotile	1.550HD	Magenta to light blue-green λ_0's ca. 520-620nm	Blue-green to pale blue λ_0's ca. 600-700nm
Amosite	1.680	Yellow to magenta λ_0's ca. 420-520nm	Blue magenta to light blue λ_0's ca. 560-660nm
Crocidolite	1.680	Yellow to magenta λ_0's ca. 420-520nm	Pale yellow to golden yellow λ_0's ca. 360-460nm
Anthophyllite-asbestos	1.605HD	Pale yellow to yellow λ_0's ca. 330-430nm	Golden yellow to light blue green λ_0's ca. 460-700nm
Tremolite-asbestos	1.605HD	Pale yellow to yellow λ_0's ca. 330-430nm	Golden yellow to light blue green λ_0's ca. 460-700nm
Actinolite-asbestos	1.605HD	Pale yellow λ_0's ca. 260-360nm	Pale yellow to golden yellow λ_0's ca. 360-460nm
	1.630HD	Yellow to magenta λ_0's ca. 420-520nm	Golden yellow to blue λ_0's ca. 450-600nm

[1]Modified from reference 16

TABLE 2-4. OPTICAL PROPERTIES OF MAN-MADE TEXTILE FIBERS[1,2]

Fiber Type	n‖	n⊥	n‖ − n⊥	Sign of Elongation
Polyester (Dacron®)	1.710	1.535	0.175	+
Polyamide (Nylon®)	1.582	1.514	0.063	+
Aramid (Kevlar®)	≈2.37	≈1.641	0.729	+
Olefin (Polyethylene)	1.556	1.512	0.044	+
Olefin (Polypropylene)	1.520	1.495	0.025	+
Viscose Rayon	1.535-1.555	1.515-1.535	0.020	+
Acetate	1.478-1.480	1.473-1.476	0.004-0.005	+
Acrylic (Orlon®)	1.505-1.515	1.507-1.517	0.004-0.002	
Modacrylic (Dynel®)	1.535	1.532	0.002	+

[1]Modified from reference 17

[2]Refractive indices for specific fibers; other fibers may vary

TABLE 2-5. OPTICAL PROPERTIES OF SELECTED FIBERS[1]

FIBER TYPE	MORPHOLOGY	REFRACTIVE INDICES	BIREFRINGENCE ($n\parallel - n\perp$)	EXTINCTION ANGLE	SIGN OF ELONGATION	DISPERSION STAINING COLORS
Paper (Cellulose)	Tapered, flat ribbons	$n\parallel$ ~ 1.580 $n\perp$ ~ 1.530	High (0.05)	Parallel and incomplete	+	in 1.550HD $n\parallel$: yellow (λ_o's < 400nm) $n\perp$: pale blue (λ_o's > 700nm)
Olefin (polyethylene)	Filaments or shredded like chrysotile	$n\parallel$ ~ 1.556 $n\perp$ ~ 1.512	Moderate (0.044)	Parallel	+	in 1.550HD $n\parallel$: yellow to magenta (λ_o's = 440-540nm) $n\perp$: pale blue (λ_o's > 700nm)
Brucite (nemalite)	Straight fibers	$n\parallel$ ~ 1.560-1.590 $n\perp$ ~ 1.580-1.600	Moderate (0.012-0.020)	Usually parallel	- occasionally +	in 1.550HD $n\parallel$: golden yellow (λ_o's 440-460nm) $n\perp$: yellow (λ_o's 400-440nm)
Heated amosite	Similar to unheated, (brittle and shorter) pleochroic: $n\parallel$-dark brown $n\perp$ yellow	$n\parallel$ and $n\perp$ >1.700[2]	High (> 0.05)	Usually parallel	+	in 1.680HD $n\parallel$ & $n\perp$: both pale yellow to white (λ_o's < 400nm)
Glass fibers, Mineral wool	Exotic shapes, tear drops, single filaments	1.515-1.700	Isotropic	------	-	in 1.550HD usually pale blue to blue (λ_o's 580 to > 700nm)
Wollastonite	Straight needles and blades	$n\parallel$ ~ 1.630 $n\perp$ ~ 1.632 $n\perp$ also 1.610	Moderate to low (0.018 to 0.002)	Parallel and oblique	+ and -	in 1.605HD $n\parallel$ & $n\perp$: yellow to pale yellow (λ_o's < 460nm)
Fibrous talc	Thin cleavage ribbons and wavy fibers	$n\parallel$ ~ 1.60 $n\perp$ ~ 1.54	High (0.06)	Parallel and oblique	+	in 1.550HD $n\parallel$: pale yellow (λ_o's <400nm) $n\perp$: pale blue (λ_o's >660nm)

[1]From reference 19

[2]From references 13, 14, and 15

2.2.5.2.3 Microscope Alignment

In order to accurately measure the required optical properties, a properly aligned polarized light microscope must be utilized. The microscope is aligned when:

1) the privileged directions of the substage polarizer and the analyzer are at 90° to one another and are represented by the ocular cross-lines;

2) the compensator plate's privileged vibration directions are 45° to the privileged directions of the polarizer and analyzer;

3) the objectives are centered with respect to stage rotation; and,

4) the substage condenser and iris diaphragm are centered in the optic axis.

Additionally, the accurate measurement of the refractive index of a substance requires the use of calibrated refractive index liquids. These liquids should be calibrated regularly to an accuracy of 0.004, with a temperature accuracy of 2°C using a refractometer or R.I. glass beads.

2.2.6 References

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2.3 Gravimetry

2.3.1 Principle and Applicability

Many components of bulk building materials, specifically binder components, can be selectively removed using appropriate solvents or, in the case of some organics, by ashing. The removal of these components serves the following purposes:

1) to isolate asbestos from the sample, allowing its weight to be determined;

2) to concentrate asbestos and therefore lower the detection limit in the total sample;

3) to aid in the detection and identification of fibrous components; and,

4) to remove organic (ashable) fibers which are optically similar to asbestos.

Common binder materials which are removed easily using the techniques described include: 1) calcite, gypsum, magnesite, brucite, bassanite, portlandite, and dolomite, using hydrochloric acid, and 2) vinyl, cellulose, and other organic components, by ashing. The removal of the binder components results in a residue containing asbestos, if initially present, and any other non-soluble or non-ashable components which were present in the original sample. Unless the procedures employed result in the loss of some asbestos, the weight percent of the residue is the upper limit for the weight percent of asbestos in the sample.

This section describes the procedure for removing acid-soluble and ashable components, and for determining the weight percent of the residue. However, the acid dissolution and ashing techniques can be used without the accompanying weight measurements to either liberate or clean fibers to aid in qualitative PLM or AEM analyses.

This technique is not an identification technique. Other methods, such as PLM, XRD, or AEM must be used to determine the identity of the components. A description of the suggested apparatus, reagents, etc. needed for the techniques described is included in Appendix B.

2.3.2 Interferences

Any components which cannot by removed from the sample by selective dissolution or ashing interfere with asbestos quantitation. These components include, but are not limited to, many silicates (micas, glass fibers, etc.) and oxides (TiO_2, magnetite, etc.). When interfering phases are present (the residue contains other phases in addition to asbestos), other techniques such as PLM, AEM, or XRD must be used to determine the percent of asbestos in the residue.

Care must be taken to prevent loss of or chemical/structural changes in the critical components (asbestos). Prolonged exposure to acids or excessive heating (above 500°C) can cause changes in the asbestos components in the sample and affect the optical properties.[1,2,3]

2.3.3 Quantitation

The weight of the residue remaining after solvent dissolution/ashing should be compared with the original weight of the material. Presuming no insoluble material is lost, the weight percent of the residue is the upper limit for the amount of asbestos in the sample. If the residue is comprised only of asbestos, then the weight percent of residue equals the weight percent of asbestos in the sample. If the residue contains other phases, then techniques such as PLM, XRD, or AEM must be employed to determine the relative abundance of asbestos in the residue.

The precision and accuracy of the technique are dependent upon the homogeneity of the material, the accuracy of the weight measurements, and the effectiveness of the sample reduction and filtering procedures. In practice, the precision can be equal to $\pm 1\%$, and the accuracy at 1 wt% asbestos can be less than or equal to $\pm 10\%$ relative.

The incomplete solution of components and the presence of other nonasbestos components in the residue contribute to producing a positive bias for the technique (falsely high percentages of asbestos).

2.3.4 Preliminary Examination and Evaluation

Stereomicroscopic and PLM examinations of the sample should already have been conducted prior to initiating this procedure. These examinations should have provided information about: 1) whether the sample contains components which can be removed by acid-washing, solvent dissolution, or ashing, and 2) whether the sample contains asbestos, or fibers that might be asbestos, or whether no asbestos was detected.

If the sample is friable and contains organic (ashable) components, the ashing procedure should be followed. If the sample is friable and contains HCl-soluble components, the acid dissolution procedure should be followed. If the sample is friable and contains both types of

components, the two procedures can be applied, preferably with acid dissolution following ashing.

If the sample is nonfriable (e.g. floor tiles), it is also recommended that the ashing procedure be used first, followed by the acid dissolution procedure. The ashing procedure reduces floor tiles to a material which is easily powdered, simplifying the sample preparation for acid dissolution.

2.3.5 Sample Preparation

2.3.5.1 Drying

Any moisture in the sample will affect the weight measurements, producing falsely low percentages of residue. If the sample is obviously wet, it should be dried at low temperature (using a heat lamp, or simply by exposure at ambient conditions, prior to starting the weighing procedure). If an oven is used, the drying temperature should not exceed 60°C. Drying by means of heat lamp or ambient air must be performed within a safety-filtered hood. Even if the sample appears dry, it can contain enough moisture to affect the precision and accuracy of the technique. The test for sample moisture involves placing the amount of sample to be used on the weighing pan; if the weight remains stable with time, then the sample is dry enough. If the weight decreases as the sample sits on the weighing pan, then the sample should be dried. Where conditions of moderate to high humidity are known to exist, all materials to be weighed should be allowed time to stabilize to these ambient conditions.

2.3.5.2 Homogenization/Grain Size Reduction

To increase the accuracy and precision of the acid dissolution technique, the sample should be homogenized prior to analysis. This reduces the grain size of the binder material and releases it from fiber bundles so that it may be dissolved in a shorter time period. Leaving the sample in the acid for a longer period of time to complete the dissolution process can adversely affect the asbestos components, and is not recommended. Homogenization of the sample also ensures that any material removed for analysis will more likely be representative of the entire sample.

Homogenization of friable samples prior to ashing may also accelerate the ashing process; however, the ashing time can simply be increased without affecting the asbestos in the sample. Nonfriable samples, such as vinyl floor tiles, can be broken or shaved into pieces to increase surface area and accelerate the ashing process.

Homogenization and grain size reduction can be accomplished in a variety of ways: 1) hand grinding in a mortar and pestle; 2) crushing with pliers or similar instrument; 3) mixing in a blender; 4) milling (i.e. Wylie mill, cryomill, etc.); or 5) any other technique which seems suitable. If the fibers are extremely long, a pair of scissors or similar implement can be used to reduce the fiber length.

2.3.6 Procedure for Ashing

1) **Weigh appropriate amount of material.**

   There is no restriction on the maximum weight of material used; however, a large amount of material may take longer to ash. Enough material should be used to avoid a significant contribution of weighing errors to the total accuracy and precision.

2) **Place material in crucible, weigh, and cover with lid.**

   Placing a lid on the crucible both minimizes the amount of oxygen available, slowing the rate of combustion of the sample, and prevents any foreign material from falling into the crucible during ashing.

3) **Place crucible into furnace, and ash for at least 6 hours.**

   The furnace temperature at the sample position should be at least 300°C but should not exceed 500°C. If the sample combusts (burns), the temperature of the sample may exceed 500°C. Chrysotile will decompose above approximately 500°C.

   The furnace area should be well-ventilated and the fumes produced by ashing should be exhausted outside the building.

   The ashing time is dependent on the furnace temperature, the amount of sample, and the surface area (grain size). Six hours at 450°C is usually sufficient.

4) **Remove crucible from furnace, allow contents to adjust to room temperature and humidity, and weigh.**

5) **Divide residue weight by starting weight and multiply by 100 to determine weight% residue.**

6) **Analyze residue and/or proceed to acid dissolution procedure.**

If the objective was to remove organic fibers that may be confused optically with asbestos, examine residue with PLM to determine whether any fibers remain.

If the sample is a floor tile, the acid dissolution procedure must now be performed. The residue does not have to be analyzed at this stage.

2.3.7 Use of Solvents for Removal of Organics

Solvent dissolution may be used as a substitute for low temperature ashing for the purpose of removing organic interferences from bulk building materials. However, solvent dissolution, because of the involvement of potentially hazardous reagents such as tetrahydrofuran, amyl acetate, 1-1-1, trichlorethane, etc., requires **that all work be performed with extreme caution inside a biohazard hood**. Material Safety Data Sheets should be reviewed before using any solvent. Solvent dissolution involves more apparatus than does ashing, and requires more time, mainly due to set-up and slow filtration resulting from viscous solvent/residue mixtures.

The following is a brief description of the solvent dissolution process.

1) **Weigh starting material.**

Place approximately 15-25ml of solvent in a 100ml beaker. Add 2.5-3.0 grams (carefully weighed for continued gravimetric tracking) of powdered sample.

2) **Untrasonicate sample.**

Place the beaker in an ultrasonic bath (or ultrasonic stirrer) for approximately 0.5 hours. The sample containers should be covered to preclude escape of an aerosol spray.

3) **Centrifuge sample.**

Weigh centrifuge vial before adding beaker ingredients. Wash beaker with an additional 10-15ml of solvent to remove any remaining concentrate. Then centrifuge

at approximately 2000-2500 rpm for 0.5 hour. Use solvent-resistant centrifuge tubes.

4) **Decant sample, reweigh.**

After separation by centrifuging, decant solvent by pipetting. Leave a small amount of solvent in the centrifuge vial to minimize the risk of decanting solid concentrate. Allow solid concentrate to dry in vial, then reweigh.

2.3.8 Procedure for Acid Dissolution

1) **Weigh starting material, transfer to acid resistant container.**

Small, dry sample weights between 0.1g and 0.5g are recommended (determined for 47mm filters adjust amount if different diameter filters are used). If too much material is left after acid dissolution the filter can get clogged and prevent complete filtration. Very small samples are also to be avoided, as the weighing errors will have a large effect on the total accuracy and precision of the technique.

2) **Weigh filter.**

3) **Add HCl to sample in container, stir, allow to sit for 2-10 minutes.**

Either concentrated or dilute HCl can be used. If concentrated HCl is used, add enough acid to completely soak the material, allow the reaction to proceed to completion, and then dilute with distilled water. Alternatively, a dilute solution, made by adding concentrated HCl to distilled water, can be used in the place of concentrated HCl. A solution of 1 part concentrated HCl to 3 parts distilled water (approximately 3N solution) has been found to be quite effective in removing components within 5 minutes. For a sample size less than 0.5g, 20-30 ml of a 3N HCl solution is appropriate. In either case (using concentrated or dilute HCl), the reaction will be more effective if the sample has been homogenized first. All obvious signs of reaction (bubbling) should cease before the sample is filtered. Add fresh acid, a ml or two at a time, to ensure complete reaction. It should be noted that if dolomite is present, a 15-20 minute exposure to concentrated HCl may be required to completely dissolve the carbonate materials.

NOTE: Other solvents may be useful for selective dissolution of nonasbestos components. For example, acetic acid will dissolve calcite, and will not dissolve asbestos minerals. If any solvent other than hydrochloric acid is used for the dissolution of inorganic components, the laboratory must be able to demonstrate that the solvent does not remove asbestos from the sample.

4) **Filter solution.**

Use the pre-weighed filter. Pour the solution into the vacuum filter assembly, then rinse all material from container into filter assembly. Rinse down the inside walls of the glass filter basin and check for particles clinging to the basin after removal.

5) **Weigh dried filter + residue, subtract weight of filter from total.**

6) **Divide residue weight by starting weight and multiply by 100 to determine weight% residue.**

7) **Analyze residue.**

Perform stereomicroscopic examination of residue (can be performed without removing the residue from the filter). Note in particular whether any binder material is still present.

Perform PLM, AEM, or XRD analysis of residue to identify fibers and determine concentration as described in the appropriate sections of this method.

8) **Modify procedure if necessary.**

If removal of the acid soluble components was not complete, start with a new subsample of material and try any of the following:

a) Decrease grain size of material (by grinding, milling, etc.)
b) Put solutions on hot plate warm slightly
c) Increase soak time (exercise caution)

9) **Calculate relative weight% asbestos in sample.**

wt% asbestos in sample = % asbestos in residue x wt% residue ÷ 100

For floor tiles, if the ashing procedure was used first, multiply the weight % of asbestos in the sample, as determined above, by the weight percent of the residue from the ashing procedure, then divide by 100.

Example:
A = wt% residue from ashing = 70%
B = wt% residue from HCl = 20%
C = wt% of asbestos in HCl residue = 50%

wt% asbestos after HCl dissolution = B x C ÷ 100 = 20 x 50 ÷ 100 = 10%

wt% asbestos in floor tile = (B x C ÷ 100) x A ÷ 100 = 10 x 70 ÷ 100 = 7%

If weights are expressed in decimal form, multiply the weight % of asbestos in the sample by the weight % of the residue from the ashing procedure, then multiply by 100.

wt% asbestos after HCl dissolution = B x C = 0.2 x 0.5 = 0.1 (x 100 = 10%)

wt% asbestos in floor tile = (B x C) x A = 0.1 x 0.7 = 0.07 (x 100 = 7%)

2.3.9 Determination of Optimal Precision and Accuracy

The precision of the technique can be determined by extracting multiple subsamples from the original sample and applying the same procedure to each. The optimal accuracy of the technique can be determined by applying gravimetric standards. Mixtures of calcite and asbestos (chrysotile, amosite, etc.) in the following proportions are recommended for testing the accuracy of the acid dissolution technique: 0.1 wt% asbestos/99.9 wt% calcite, 1.0 wt% asbestos/99.0 wt% calcite, and 10 wt% asbestos/90 wt% calcite. Mixtures of cellulose and asbestos are useful for testing the accuracy of the ashing technique.

Mixtures of only two components, as described above, are simplifications of "real-world" samples. The accuracy determined by analyzing these mixtures is considered optimal and may not apply directly to the measurement of each unknown sample. However, analyzing replicates and standards using the full laboratory procedure, including homogenization, ashing, acid dissolution, filtration, and weighing, may uncover steps that introduce significant bias or variation that the laboratory may then correct.

2.3.10 References

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3. Laughlin, G. and W. C. McCrone, "The Effect of Heat on the Microscopical Properties of Asbestos", **The Microscope,** 37, 1989, pp. 8-15.

2.4 X-Ray Powder Diffraction

2.4.1 Principle and Applicability

The principle of x-ray powder diffraction (XRD) analysis is well established.[1,2] Any solid crystalline material will diffract an incident beam of parallel, monochromatic x-rays whenever Bragg's Law,

$$\lambda = 2d \sin \theta,$$

is satisfied for a particular set of planes in the crystal lattice, where

λ = the x-ray wavelength, Å;
d = the interplanar spacings of the set of reflecting lattice planes, Å and
θ = the angle of incidence between the x-ray beam and the reflecting lattice planes.

By appropriate orientation of a sample relative to the incident x-ray beam, a diffraction pattern can be generated that will be uniquely characteristic of the structure of the crystalline phases present.

Unlike optical methods of analysis, however, XRD cannot determine crystal morphology. Therefore, in asbestos analysis, XRD does not distinguish between fibrous and nonfibrous forms of the serpentine and amphibole minerals (Table 2-6). However, when used in conjunction with methods such as PLM or AEM, XRD techniques can provide a reliable analytical method for the identification and characterization of asbestiform minerals in bulk materials.

For **qualitative** analysis by XRD methods, samples should initially be scanned over limited diagnostic peak regions for the serpentine ($\sim$7.4 Å) and amphibole (8.2-8.5 Å) minerals (Table 2-7). Standard slow-scanning methods for bulk sample analysis may be used for materials shown by PLM to contain significant amounts of asbestos (>5 percent). Detection of minor or trace amounts of asbestos may require special sample preparation and step-scanning analysis. All samples that exhibit diffraction peaks in the diagnostic regions for asbestiform minerals should be submitted to a full (5°-60° 2θ; 1° 2θ/min) qualitative XRD scan, and their diffraction patterns should be compared with standard reference powder

diffraction patterns[3] to verify initial peak assignments and to identify possible matrix interferences when subsequent quantitative analysis will be performed.

Accurate **quantitative** analysis of asbestos in bulk samples by XRD is critically dependent on particle size distribution, crystallite size, preferred orientation and matrix absorption effects, and comparability of standard reference and sample materials. The most intense diffraction peak that has been shown to be free from interference by prior qualitative XRD analysis should be selected for quantitation of each asbestiform mineral. A "thin-layer" method of analysis[5,6] can be used in which, subsequent to comminution of the bulk material to $\sim 10\ \mu m$ by suitable cryogenic milling techniques, an accurately known amount of the sample is deposited on a silver membrane filter. The mass of asbestiform material is determined by measuring the integrated area of the selected diffraction peak using a step-scanning mode, correcting for matrix absorption effects, and comparing with suitable calibration standards. Alternative "thick-layer" or bulk methods[7,8] are commonly used for **semi-quantitative analysis.**

TABLE 2-6. THE ASBESTOS MINERALS AND THEIR NONASBESTIFORM ANALOGS

Asbestiform	Nonasbestiform	Chemical Abstract Service No.
Serpentine		
Chrysotile	Antigorite, lizardite	12001-29-5
Amphibole		
Anthophyllite asbestos	Anthophyllite	77536-67-5
Cummingtonite-grunerite asbestos (Amosite)	Cummingtonite-grunerite	12172-73-5
Crocidolite	Riebeckite	12001-28-4
Tremolite asbestos	Tremolite	77536-68-6
Actinolite asbestos	Actinolite	77536-66-4

TABLE 2-7. PRINCIPAL LATTICE SPACINGS OF ASBESTIFORM MINERALS[1]

Minerals	Principal d-spacings (Å) and relative intensities			JCPDS Powder diffraction file[2] number
Chrysotile (Serpentine)	7.31_{100} 7.36_{100} 7.10_{100}	3.65_{70} 3.66_{80} 2.33_{80}	4.57_{50} 2.45_{65} 3.55_{70}	21-543[3] 25-645 22-1162 (theoretical)
Amosite (Grunerite)	8.33_{100} 8.22_{100}	3.06_{70} 3.060_{85}	2.756_{70} 3.25_{70}	17-745 (nonfibrous) 27-1170 (UICC)
Anthophyllite	3.05_{100} 3.06_{100}	3.24_{60} 8.33_{70}	8.26_{55} 3.23_{50}	9-455 16-401 (synthetic)
Crocidolite (Riebeckite)	8.35_{100} 8.40_{100}	3.10_{55} 3.12_{55}	2.720_{35} 2.726_{40}	27-1415 (UICC) 19-1061
Actinolite	2.72_{100}	2.54_{100}	3.40_{80}	25-157
Tremolite	8.38_{100} 2.706_{100} 3.13_{100}	3.12_{100} 3.14_{95} 2.706_{60}	2.705_{90} 8.43_{40} 8.44_{40}	13-437[3] 20-1310[3] (synthetic) 23-666 (synthetic mixture w/richterite)

1. This information is intended as a guide only. Complete powder diffraction data, including mineral type and source, should be referred to ensure comparability of sample and reference materials where possible. Additional precision XRD data on amosite, crocidolite, tremolite and chrysotile are available from the U.S. Bureau of Mines, Reference 4.

2. From Reference 3

3. Fibrosity questionable

This XRD method is applicable as a confirmatory method for identification and quantitation of asbestos in bulk material samples that have undergone prior analysis by PLM or other optical methods.

2.4.2 Range and Sensitivity

The range and sensitivity of the method have not been determined. They will be variable and dependent upon many factors, including matrix effects (absorption and interferences), diagnostic reflections selected and their relative intensities, preferred orientation, and instrumental limitations. A detection limit of one percent is feasible given certain sample characteristics.

2.4.3 Limitations

2.4.3.1 Interferences

Since the asbestiform and nonasbestiform analogs of the serpentine and amphibole minerals (Table 2-7) are indistinguishable by XRD techniques unless special sample preparation techniques and instrumentation are used,[9] the presence of nonasbestiform serpentines and amphiboles in a sample will pose severe interference problems in the identification and quantitative analysis of their asbestiform analogs.

The use of XRD for identification and quantitation of asbestiform minerals in bulk samples may also be limited by the presence of other interfering materials in the sample. For naturally-occurring materials, the commonly associated asbestos-related mineral interferences can usually be anticipated. However, for fabricated materials, the nature of the interferences may vary greatly (Table 2-8) and present more serious problems in identification and quantitation.[10] Potential interferences are summarized in Table 2-9 and include the following:

- **Chlorite** has major peaks at 7.19 Å and 3.58 Å that interfere with both the primary (7.31 Å) and secondary (3.65 Å) peaks for serpentine (chrysotile). Resolution of the primary peak to give good quantitative results may be possible when a step-scanning mode of operation is employed.

- **Vermiculite** has secondary peaks at 7.14 Å and 3.56 Å that could interfere with the primary peak (7.31 Å) and a secondary peak (3.65 Å) of serpentine (chrysotile).

TABLE 2-8. COMMON CONSTITUENTS IN BUILDING MATERIAL
(From Ref. 10)

A. Insulation Materials

Chrysotile
Amosite
Crocidolite
*Rock wool
*Slag wool
*Fiber glass
Gypsum ($CaSO_4 \cdot 2H_20$)
Vermiculite (micas)
*Perlite
Clays (kaolin)
*Wood pulp
*Paper fibers (talc, clay carbonate filters)
Calcium silicates (synthetic)
Opaques (chromite, magnetite inclusions in serpentine)
Hematite (inclusions in "amosite")
Magnesite
*Diatomaceous earth

B. Flooring Materials

Calcite
Dolomite
Titanium Oxide
Quartz
Antigorite
Chrysotile
Anthophyllite
Tremolite
*Organic binders
Talc
Wollastonite

C. Spray Finishes or Paints

Bassanite
Carbonate minerals (calcite, dolomite, vaterite)
Talc
Tremolite
Anthophyllite
Serpentine (including chrysotile)
Amosite
Crocidolite
*Mineral wool
*Rock wool
*Slag wool
*Fiber glass
Clays (kaolin)
Micas
Chlorite
Gypsum
Quartz
*Organic binders and thickeners
Hydromagnesite
Wollastonite
Opaques (chromite, magnetite inclusion in serpentine)
Hematite (inclusions in "amosite")

D. Cementitious Materials

Chrysotile
Amosite
Crocidolite
Micas
Fiber glass
Cellulose
Animal hair
Quartz
Gypsum
Calcite
Dolomite
Calcium silicates

E. Roofing Materials

Chrysotile
Cellulose
Fiber glass
Mineral Wool
Asphalt
Quartz
Talc
Micas

* Amorphous materials--contribute only to overall scattered radiation and increased background radiation.

TABLE 2-9 INTERFERENCES IN XRD ANALYSIS OF ASBESTIFORM MINERALS

Asbestiform Mineral	Primary diagnostic peaks (approximate d spacings in Å)	Interference
Serpentine Chrysotile	7.3	Nonasbestiform serpentines, (antigorite, lizardite), chlorite, vermiculite, sepiolite, kaolinite, gypsum
	3.7	Nonasbestiform serpentines (antigorite, lizardite), chlorite, vermiculite, halloysite, cellulose
Amphibole Amosite (Grunerite) Anthophyllite Crocidolite (Riebeckite) Tremolite Actinolite	3.1	Nonasbestiform amphiboles (grunerite-cummingtonite, anthophyllite, riebeckite, tremolite), mutual interferences, talc, carbonates
	8.3	Nonasbestiform amphiboles (grunerite-cummingtonite, anthophyllite, riebeckite, tremolite), mutual interferences

- **Sepiolite** produces a peak at 7.47 Å which could interfere with the primary peak (7.31 Å) of serpentine (chrysotile).

- **Halloysite** has a peak at 3.63 Å that interferes with the secondary (3.65 Å) peak for serpentine (chrysotile).

- **Kaolinite** has a major peak at 7 15 Å that may interfere with the primary peak of serpentine (chrysotile) at 7.31 Å when present at concentrations of > 10 percent. However, the secondary serpentine (chrysotile) peak at 3.65 Å may be used for quantitation.

- **Gypsum** has a major peak at 7.5 Å that overlaps the 7.31 Å peak of serpentine (chrysotile) when present as a major sample constituent. This may be removed by careful washing with distilled water, or by heating to 300°C to convert gypsum to plaster of paris (bassanite).

- **Cellulose** has a broad peak that partially overlaps the secondary (3.65 Å) serpentine (chrysotile) peak.[8]

- Overlap of major diagnostic peaks of the amphibole minerals, grunerite (amosite), anthophyllite, riebeckite (crocidolite), and tremolite, at approximately 8.3 Å and 3.1 Å causes mutual interference when these minerals occur in the presence of one another. In some instances adequate resolution may be attained by using step-scanning methods and/or by decreasing the collimator slit width at the x-ray port.

- **Carbonates** may also interfere with quantitative analysis of the amphibole minerals grunerite (amosite), anthophyllite, riebeckite (crocidolite), and tremolite-actinolite. Calcium carbonate ($CaC0_3$) has a peak at 3.035 Å that overlaps major amphibole peaks at approximately 3.1 Å when present in concentrations of >5 percent. Removal of carbonates with a dilute acid wash is possible; however, the time in acid should be no more than 20 minutes to preclude any loss of chrysotile.[11]

- A major **talc** peak at 3.12 Å interferes with the primary tremolite peak at this same position and with secondary peaks of actinolite (3.14 Å), riebeckite (crocidolite) (3.10 Å), grunerite (amosite) (3.06 Å), and anthophyllite (3.05 Å). In the presence of talc, the major diagnostic peak at approximately 8.3 Å should be used for quantitation of these asbestiform minerals.

The problem of intraspecies and matrix interference is further aggravated by the variability of the silicate mineral powder diffraction patterns themselves, which often makes definitive identification of the asbestos minerals by comparison with standard reference diffraction patterns difficult. This variability results from alterations in the crystal lattice associated with differences in isomorphous substitution and degree of crystallinity. This is especially true for the amphiboles. These minerals exhibit a wide variety of very similar chemical compositions, resulting in diffraction patterns characterized by having major (110) reflections of the monoclinic amphiboles and (210) reflections of orthorhombic anthophyllite separated by less than 0.2 Å.[12]

2.4.3.2 Matrix Effects

If a copper x-ray source is used, the presence of iron at high concentrations in a sample will result in significant x-ray fluorescence, leading to loss of peak intensity, increased background intensity, and an overall decrease in sensitivity. This situation may be corrected by use of an x-ray source other than copper; however, this is often accompanied both by loss of intensity and by decreased resolution of closely spaced reflections. Alternatively, use of a

diffracted beam monochromator will reduce background fluorescent radiation, enabling weaker diffraction peaks to be detected.

X-ray absorption by the sample matrix will result in overall attenuation of the diffracted beam and may seriously interfere with quantitative analysis. Absorption effects may be minimized by using sufficiently "thin" samples for analysis.[5,13,14] However, unless absorption effects are known to be the same for both samples and standards, appropriate corrections should be made by referencing diagnostic peak areas to an internal standard[7,8] or filter substrate (Ag) peak.[5,6]

2.4.3.3 Particle Size Dependence

Because the intensity of diffracted x-radiation is particle-size dependent, it is essential for accurate quantitative analysis that both sample and standard reference materials have similar particle size distributions. The optimum particle size (i.e., fiber length) range for quantitative analysis of asbestos by XRD has been reported to be 1 to 10 μm.[15] Comparability of sample and standard reference material particle size distributions should be verified by optical microscopy (or another suitable method) prior to analysis.

2.4.3.4 Preferred Orientation Effects

Preferred orientation of asbestiform minerals during sample preparation often poses a serious problem in quantitative analysis by XRD. A number of techniques have been developed for reducing preferred orientation effects in "thick layer" samples.[7,8,15] For "thin" samples on membrane filters, the preferred orientation effects seem to be both reproducible and favorable to enhancement of the principal diagnostic reflections of asbestos minerals, actually increasing the overall sensitivity of the method.[12,14] However, further investigation into preferred orientation effects in both thin layer and bulk samples is required.

2.4.3.5 Lack of Suitably Characterized Standard Materials

The problem of obtaining and characterizing suitable reference materials for asbestos analysis is clearly recognized. The National Institute of Standards and Technology can

provide standard reference materials for chrysotile, amosite and crocidolite (SRM 1866) and anthophyllite, tremolite and actinolite (SRM 1867).

In addition, the problem of ensuring the comparability of standard reference and sample materials, particularly regarding crystallite size, particle size distribution, and degree of crystallinity, has yet to be adequately addressed. For example, Langer et al.[18] have observed that in insulating matrices, chrysotile tends to break open into bundles more frequently than amphiboles. This results in a line-broadening effect with a resultant decrease in sensitivity. Unless this effect is the same for both standard and sample materials, the amount of chrysotile in the sample will be under-estimated by XRD analysis. To minimize this problem, it is recommended that standardized matrix reduction procedures be used for both sample and standard materials.

2.4.4 Precision and Accuracy

Neither the precision nor accuracy of this method has been determined. The individual laboratory should obtain or prepare a set of calibration materials containing a range of asbestos weight percent concentrations in combination with a variety of matrix/binder materials. Calibration curves may be constructed for use in semi-quantitative analysis of bulk materials.

2.4.5 Procedure

2.4.5.1 Sampling

Samples taken for analysis of asbestos content should be collected as specified by EPA[19]

2.4.5.2 Analysis

All samples must be analyzed initially for asbestos content by PLM. XRD may be used as an additional technique, both for identification and quantitation of sample components. **Note: Asbestos is a toxic substance. All handling of dry materials should be performed in a safety-hood.**

2.4.5.2.1 Sample Preparation

The method of sample preparation required for XRD analysis will depend on: (1) the condition of the sample received (sample size, homogeneity, particle size distribution, and overall composition as determined by PLM); and (2) the type of XRD analysis to be performed (qualitative or quantitative; thin-layer or bulk).

Bulk materials are usually received as heterogeneous mixtures of complex composition with very wide particle size distributions. Preparation of a homogeneous, representative sample from asbestos-containing materials is particularly difficult because the fibrous nature of the asbestos minerals inhibits mechanical mixing and stirring, and because milling procedures may cause adverse lattice alterations.

A discussion of specific matrix reduction procedures is given below. Complete methods of sample preparation are detailed in Sections 2.4.5.3 and 2.4.5.4. **Note: All samples should be examined microscopically before and after each matrix reduction step to monitor changes in sample particle size distribution, composition, and crystallinity, and to ensure sample representativeness and homogeneity for analysis.**

2.4.5.2.2 Milling

Mechanical milling of asbestos materials has been shown to decrease fiber crystallinity, with a resultant decrease in diffraction intensity of the specimen; the degree of lattice alteration is related to the duration and type of milling process.[20-23] Therefore, all milling times should be kept to a minimum.

For **qualitative analysis**, particle size is not usually of critical importance and initial characterization of the material with a minimum of matrix reduction is often desirable to document the composition of the sample as received. Bulk samples of very large particle size (>2-3 mm) should be comminuted to ~100 μm. A mortar and pestle can sometimes be used in size reduction of soft or loosely bound materials though this may cause matting of some samples. Such samples may be reduced by cutting with a razor blade in a mortar, or by grinding in a suitable mill (e.g., a microhammer mill or equivalent). When using a mortar for grinding or cutting, the sample should be moistened with ethanol, or some other

suitable wetting agent, to minimize exposure, and the procedure should be performed in a HEPA-filtered hood.

For accurate, reproducible **quantitative analysis**, the particle size of both sample and standard materials should be reduced to $\sim 10\ \mu m$. Dry ball milling at liquid nitrogen temperatures (e.g., Spex Freezer Mill*, or equivalent) for a maximum time of 10 minutes (some samples may require much shorter milling time) is recommended to obtain satisfactory particle size distributions while protecting the integrity of the crystal lattice.[5] Bulk samples of very large particle size may require grinding in two stages for full matrix reduction to $< 10\ \mu m$.[8,16]

Final particle size distributions should always be verified by optical microscopy or another suitable method.

2.4.5.2.3 Ashing

For materials shown by PLM to contain large amounts of cellulose or other organic materials, it may be desirable to ash prior to analysis to reduce background radiation or matrix interference. Since chrysotile undergoes dehydroxylation at temperatures between 550°C and 650°C, with subsequent transformation to forsterite,[24,25] ashing temperatures should be kept below 500°C. Use of a muffle furnace is recommended. In all cases, calibration of the furnace is essential to ensure that a maximum ashing temperature of 500°C is not exceeded (see Section 2.3).

2.4.5.2.4 Acid Washing

Because of the interference caused by gypsum and some carbonates in the detection of asbestiform minerals by XRD (see Section 2.4.3.1), it may be necessary to remove these interferences by a simple acid washing procedure prior to analysis (see Section 2.3).

2.4.5.3 Qualitative Analysis

2.4.5.3.1 Initial Screening of Bulk Material

Qualitative analysis should be performed on a representative, homogeneous portion of the sample, with a minimum of sample treatment, using the following procedure:

1. Grind and mix the sample with a mortar and pestle (or equivalent method, see Section 2.4.5.2.2) to a final particle size sufficiently small (~ 100 μm) to allow adequate packing into a sample holder.

2. Pack sample into a standard bulk sample holder. Care should be taken to ensure that a representative portion of the milled sample is selected for analysis. Particular care should be taken to avoid possible size segregation of the sample. **(Note: Use of back-packing method[26] for bulk sample preparation may reduce preferred orientation effects.)**

3. Mount the sample on the diffractometer and scan over the diagnostic peak regions for the serpentine (~ 7.4 Å) and amphibole (8.2-8.5 Å) minerals (see Table 2-7). The x-ray diffraction equipment should be optimized for intensity. A slow scanning speed of 1° 2θ/min is recommended for adequate resolution. Use of a sample spinner is recommended.

4. Submit all samples that exhibit diffraction peaks in the diagnostic regions for asbestiform minerals to a full qualitative XRD scan (5°-60° 2θ; 1° 2θ/min) to verify initial peak assignments and to identify potential matrix interferences when subsequent quantitative analysis is to be performed.

5. Compare the sample XRD pattern with standard reference powder diffraction patterns (i.e., JCPDS powder diffraction data[3] or those of other well-characterized reference materials). Principal lattice spacings of asbestiform minerals are given in Table 2-7; common constituents of bulk insulation and wall materials are listed in Table 2-8.

2.4.5.3.2 Detection of Minor or Trace Constituents

Routine screening of bulk materials by XRD may fail to detect small concentrations ($< 1\%$) of asbestos. The limits of detection will, in general, be improved if matrix absorption effects are minimized, and if the sample particle size is reduced to the optimal 1 to 10 μm range, provided that the crystal lattice is not degraded in the milling process. Therefore, in those instances when confirmation of the presence of an asbestiform mineral at very low levels is required, or where a negative result from initial screening of the bulk material by XRD (see Section 2.4.5.3.1) is in conflict with previous PLM results, it may be desirable to prepare the sample as described for quantitative analysis (see Section 2.4.5.4) and step-scan over appropriate 2θ ranges of selected diagnostic peaks (Table 2-7). Accurate

transfer of the sample to the silver membrane filter is not necessary unless subsequent quantitative analysis is to be performed.

2.4.5.4 Quantitative Analysis

The proposed method for quantitation of asbestos in bulk samples is a modification of the NIOSH-recommended thin-layer method for chrysotile in air.[6] A thick-layer bulk method involving pelletizing the sample may be used for semi-quantitative analysis;[7,8] however, this method requires the addition of an internal standard, use of a specially fabricated sample press, and relatively large amounts of standard reference materials. Additional research is required to evaluate the comparability of thin- and thick-layer methods for quantitative asbestos analysis.

For quantitative analysis by thin-layer methods, the following procedure is recommended:

1. Mill and size all or a substantial representative portion of the sample as outlined in Section 2.4.5.2.2.

2. Dry at 60°C for 2 hours; cool in a desiccator.

3. Weigh accurately to the nearest 0.01 mg.

4. Samples shown by PLM to contain large amounts of cellulosic or other organic materials, gypsum, or carbonates, should be submitted to appropriate matrix reduction procedures described in Sections 2.4.5.2.3 and 2.4.5.2.4. After ashing and/or acid treatment, repeat the drying and weighing procedures described above, and determine the percent weight loss, L.

5. Quantitatively transfer an accurately weighed amount (50-100 mg) of the sample to a 1-L volumetric flask containing approximately 200 mL isopropanol to which 3 to 4 drops of surfactant have been added.

6. Ultrasonicate for 10 minutes at a power density of approximately 0.1 W/mL, to disperse the sample material.

7. Dilute to volume with isopropanol.

8. Place flask on a magnetic-stirring plate. Stir.

9. Place silver membrane filter on the filtration apparatus, apply a vacuum, and attach the reservoir. Release the vacuum and add several milliliters of isopropanol to the reservoir. Vigorously hand shake the asbestos suspension and immediately withdraw

an aliquot from the center of the suspension so that total sample weight, W_T, on the filter will be approximately 1 mg. Do not adjust the volume in the pipet by expelling part of the suspension; if more than the desired aliquot is withdrawn, discard the aliquot and repeat the procedure with a clean pipet. Transfer the aliquot to the reservoir. Filter rapidly under vacuum. Do not wash the reservoir walls. Leave the filter apparatus under vacuum until dry. Remove the reservoir, release the vacuum, and remove the filter with forceps. (Note: Water-soluble matrix interferences such as gypsum may be removed at this time by careful washing of the filtrate with distilled water. Extreme care should be taken not to disturb the sample.)

10. Attach the filter to a flat holder with a suitable adhesive and place on the diffractometer. Use of a sample spinner is recommended.

11. For each asbestos mineral to be quantitated, select a reflection (or reflections) that has (have) been shown to be free from interferences by prior PLM or qualitative XRD analysis and that can be used unambiguously as an index of the amount of material present in the sample (see Table 2-7).

12. Analyze the selected diagnostic reflection(s) by step-scanning in increments of 0.02° 2θ for an appropriate fixed time and integrating the counts. (A fixed count scan may be used alternatively; however, the method chosen should be used consistently for all samples and standards.) An appropriate scanning interval should be selected for each peak, and background corrections made. For a fixed time scan, measure the background on each side of the peak for one-half the peak-scanning time. The net intensity, I_a, is the difference between the peak integrated count and the total background count.

13. Determine the net count, I_{Ag}, of the filter 2.36 Å silver peak following the procedure in step 12. Remove the filter from the holder, reverse it, and reattach it to the holder. Determine the net count for the unattenuated silver peak, I°_{Ag}. Scan times may be less for measurement of silver peaks than for sample peaks; however, they should be constant throughout the analysis.

14. Normalize all raw, net intensities (to correct for instrument instabilities) by referencing them to an external standard (e.g., the 3.34 Å peak of an α-quartz reference crystal). After each unknown is scanned, determine the net count, I°_r, of the reference specimen following the procedure in step 12. Determine the normalized intensities by dividing the peak intensities by I°_r:

$$\hat{I}_a = \frac{I_a}{I_r^\circ}, \quad \hat{I}_{Ag} = \frac{I_{Ag}}{I_r^\circ}, \text{ and } \hat{I}_{Ag}^\circ = \frac{I_{Ag}^\circ}{I_r^\circ}$$

2.4.6 Calibration

2.4.6.1 Preparation of Calibration Standards

1. Mill and size standard asbestos materials according to the procedure outlined in Section 2.4.5.2.2. **Equivalent standardized matrix reduction and sizing techniques should be used for both standard and sample materials.**

2. Dry at 100°C for 2 hours; cool in a desiccator.

3. Prepare two suspensions of each standard in isopropanol by weighing approximately 10 and 50 mg of the dry material to the nearest 0.01 mg. Transfer each to a 1-L volumetric flask containing approximately 200 mL isopropanol to which a few drops of surfactant have been added.

4. Ultrasonicate for 10 minutes at a power density of approximately 0.1 W/mL, to disperse the asbestos material.

5. Dilute to volume with isopropanol.

6. Place the flask on a magnetic stirring plate. Stir.

7. Prepare, in triplicate, a series of at least five standard filters to cover the desired analytical range, using appropriate aliquots of the 10 and 50 mg/L suspensions. For each standard, mount a silver membrane filter on the filtration apparatus. Place a few mL of isopropanol in the reservoir. Vigorously hand shake the asbestos suspension and immediately withdraw an aliquot from the center of the suspension. Do not adjust the volume in the pipet by expelling part of the suspension; if more than the desired aliquot is withdrawn, discard the aliquot and resume the procedure with a clean pipet. Transfer the aliquot to the reservoir. Keep the tip of the pipet near the surface of the isopropanol. Filter rapidly under vacuum. Do not wash the sides of the reservoir. Leave the vacuum on for a time sufficient to dry the filter. Release the vacuum and remove the filter with forceps.

2.4.6.2 Analysis of Calibration Standards

1. Mount each filter on a flat holder. Perform step scans on selected diagnostic reflections of the standards and reference specimen using the procedure outlined in Section 2.4.5.4, step 12, and the same conditions as those used for the samples.

2. Determine the normalized intensity for each peak measured, $\hat{I}^{\circ}_{std}$, as outlined in Section 2.4.5.4, step 14.

2.4.7 Calculations

For each asbestos reference material, calculate the exact weight deposited on each standard filter from the concentrations of the standard suspensions and aliquot volumes. Record the weight, w, of each standard. Prepare a calibration curve by regressing $\hat{I}^{\circ}_{std}$, on w. Poor reproducibility ($\pm$15 percent RSD) at any given level indicates problems in the sample preparation technique, and a need for new standards. The data should fit a straight-line equation.

Determine the slope, m, of the calibration curve in counts/microgram. The intercept, b, of the line with the $\hat{I}^{\circ}_{std}$ axis should be approximately zero. A large negative intercept indicates an error in determining the background. This may arise from incorrectly measuring the baseline or from interference by another phase at the angle of background measurement. A large positive intercept indicates an error in determining the baseline or that an impurity is included in the measured peak.

Using the normalized intensity, $\hat{I}_{Ag}$ for the attenuated silver peak of a sample, and the corresponding normalized intensity from the unattenuated silver peak $\hat{I}^{\circ}_{Ag}$, of the sample filter, calculate the transmittance, T, for each sample as follows:[27,28]

$$T = \frac{\hat{I}_{Ag}}{\hat{I}^{\circ}_{Ag}}$$

Determine the correction factor, f(T), for each sample according to the formula:

$$f(T) = \frac{-R(\ln T)}{1 - T^R}$$

where

$$R = \frac{\sin \theta_{Ag}}{\sin \theta_a}$$

θ_{Ag} = angular position of the measured silver peak (from Bragg's Law), and

θ_a = angular position of the diagnostic asbestos peak.

Calculate the weight, W_a, in micrograms, of the asbestos material analyzed for in each sample, using the absorption corrections:

$$W_a = \frac{\hat{I}_a f(t) - b}{m}$$

Calculate the percent composition, P_a, of each asbestos mineral analyzed for in the parent material, from the total sample weight, W_T, on the filter:

$$P_a = \frac{W_a(1 - .01L)}{W_T} \times 100$$

where

P_a = percent asbestos mineral in parent material;

W_a = mass of asbestos mineral on filter, in μg;

W_T = total sample weight on filter, in μg;

L = percent weight loss of parent material on ashing and/or acid treatment (see Section 2.4.5.4).

2.4.8 References

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2.5 Analytical Electron Microscopy

2.5.1 Applicability

Analytical electron microscopy (AEM) can often be a reliable method for the detection and positive identification of asbestos in some bulk building materials, both friable and nonfriable. The method is particularly applicable to bulk materials that contain a large amount of interfering materials that can be removed by ashing and/or dissolution and contain asbestos fibers that are not resolved by PLM techniques. Many floor tiles and plasters would be included in this type of sample. In combination with suitable specimen preparation techniques, the AEM method can also be used to quantify asbestos concentrations.

2.5.2 Range

The range is dependent on the type of bulk material being analyzed. The upper detection limit is 100%, and the lower detection limit can be as low as 0.0001% depending on the extent to which interfering materials can be separated during the preparation of AEM

specimens, the sophistication of the AEM preparation, and the amount of labor expended on AEM examination.

2.5.3 Interferences

The presence of a large amount of binder/matrix materials associated with fibers can make it difficult to positively identify fibers as asbestos. The portion of the fiber examined by either electron diffraction or energy dispersive x-ray analysis (EDXA) must be free of binder/matrix materials.

2.5.4 Precision and Accuracy

The precision and accuracy of the method have not been determined.

2.5.5 Procedures

The procedures for AEM specimen preparation depend on the data required. In analysis of floor tiles, the weighed residue after removal of the matrix components (see Section 2.3, Gravimetry) is often mostly asbestos, and the task is primarily to identify the fibers. In this situation the proportion of asbestos in the residue can be estimated by AEM and this estimate can be used to refine the gravimetric result. For many floor tiles, the final result is not very sensitive to errors in this estimation because the proportion of asbestos in the residue is very high. For samples in which this is not the case, precise measurements can be made using a quantitative AEM preparation, in which each grid opening of the specimen grid corresponds to a known weight of the original sample or of a concentrate derived from the original sample. Asbestos fibers on these grids are then identified and measured, using a fiber counting protocol which is directed towards a precise determination of mass concentration. This latter procedure is suitable for samples of low asbestos concentration, or for those in which it is not possible to remove a large proportion of the matrix material.

2.5.5.1 AEM Specimen Preparation for Semi-Quantitative Evaluation

The residual material from any ashing or dissolution procedures (see Section 2.3) used (usually trapped on a membrane filter) should be placed in a small volume of ethanol or another solvent such as acetone or isopropyl alcohol, in a disposable beaker, and dispersed

by treatment in an ultrasonic bath. A small volume of this suspension (approximately 3μl) should be pipetted onto the top of a carbon-coated TEM grid. The suspension should be allowed to dry under a heat lamp. The grid is then ready for examination.

Samples that are not conducive to ashing or dissolution may also be prepared in this way for AEM analysis. A few milligrams of the sample may be ground in a mortar and pestle or milled, dispersed in ethanol or another solvent using an ultrasonic bath, and pipetted onto a grid as described previously.

2.5.5.2 AEM Specimen Preparation for Quantitative Evaluation

The objective of this preparation is to obtain a TEM grid on which a known weight of the bulk sample is represented by a known area of the TEM grid. A known weight of the bulk sample, or of the residue after extraction, should be dispersed in a known volume of distilled water. Aliquots of this dispersion should then be filtered through 0.22 μm pore-size MCE or 0.2 μm pore-size PC filters, using filtration techniques as described for analysis of water samples.[1] In order to obtain filters of appropriate particulate loading for AEM analysis, it may be necessary to perform serial dilutions of the initial dispersion. TEM grids should then be prepared from appropriately-loaded filters, using the standard methods.[2]

Determination of the mass concentration of asbestos on the TEM grids requires a different fiber counting protocol than that usually used for determination of numerical fiber concentrations. Initially, the grids should be scanned to determine the dimensions of the largest asbestos fiber or fiber bundle on the specimens. The volume of this fiber or bundle should be calculated. The magnification of the AEM should be set at a value for which the length of this fiber or bundle just fills the fluorescent screen. Asbestos fiber counting should then be continued at this magnification. The count should be terminated when the volume of the initial large fiber or bundle represents less than about 5% of the integrated volume of all asbestos fibers detected. This counting strategy ensures that the fiber counting effort is directed toward those fibers which contribute most to the mass, and permits a precise mass concentration value to be obtained.

2.5.5.2.1 Identification

To document the positive identification of asbestos in a sample, the analyst should record the following physical properties: morphology data, electron diffraction data, EDXA data, and any other distinguishing characteristics observed. For fibrous structures identified as nonasbestos, the unique physical property or properties that differentiate the material from asbestos should be recorded.

The purpose of the identification data collected is to prevent or limit false negatives and false positives. This can be accomplished by having a system for measuring and recording the d-spacings and symmetry of the diffraction patterns, determining the relative abundance of the elements detected by EDXA, and comparing these results to reference data. The laboratory should have a set of reference asbestos materials from which a set of reference diffraction patterns and x-ray spectra have been developed. Also, the laboratory should have available reference data on the crystallography and chemical composition of minerals that might analytically interfere with asbestos.

2.5.6 References

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2.6 Other Methodologies

Additional analytical methods (e.g. Scanning Electron Microscopy) may be applicable for some bulk materials. However, the analyst should take care to recognize the limitations of any analytical method chosen. Conventional SEM, for example, cannot detect small diameter fibers ($\sim < 0.2\mu m$), and cannot determine crystal structure. It is, however, very useful for observing surface features in complex particle matrices, and for determining elemental compositions.

3.0 QUALITY CONTROL/QUALITY ASSURANCE OPERATIONS- PLM

A program to routinely assess the quality of the results produced by the PLM laboratory must be developed and implemented. **Quality Control (QC)** is a system of activities whose purpose is to control the quality of the product or service so that it meets the need of the users. This also includes **Quality Assessment**, whose purpose is to provide assurance that the overall quality control is being done effectively. While the essential elements of a quality control system are described in detail elsewhere,[1,2,3,4,5,6] only several of the elements will be discussed here. **Quality Assurance (QA)** is comprised of Quality Control and Quality Assessment and is a system of activities designed to provide assurance that a product or service meets defined standards of quality.

The purpose of the Quality Assurance program is to minimize failures in the analysis of materials prior to submitting the results to the client. Failures in the analysis of asbestos materials include false positives, false negatives, and misidentification of asbestos types. False positives result from identification or quantitation errors. False negatives result from identification, detection, or quantitation errors.

For the stereomicroscopic and PLM techniques, the quality control procedures should characterize the accuracy and precision of both individual analysts and the techniques. Analysts should demonstrate their abilities on calibration materials, and also be checked routinely on the analysis of unknowns by comparison with results of a second analyst. The limitations of the stereomicroscopic and PLM techniques can be determined by using a second analytical technique, such as gravimetry, XRD, or AEM. For example, stereomicroscopic and PLM techniques can fail in the analysis of floor tiles because the asbestos fibers in the sample may be too small to be resolved by light microscopy. An XRD or AEM analysis is not subject to the same limitations, and may indicate the presence of asbestos in the sample.

The accuracy, precision, and detection limits of all analytical techniques described in this method are dependent on the type of sample (matrix components, texture, etc.), on the preparation of the sample (homogeneity, grain size, etc.), and the specifics of the method (number of point counts for PLM, mass of sample for gravimetry, counting time for XRD,

etc.). These should be kept in mind when designing quality control procedures and characterizing performance, and are variables that must be tracked in the quality assurance system.

3.1 General Considerations

3.1.1 Training

Of paramount importance in the successful use of this or any other analytical method is the well-trained analyst. It is highly recommended that the analyst have completed course work in optical mineralogy on the collegiate level. That is not to say that others cannot successfully use this method, but the classification error rate[7] may, in some cases, be directly attributable to level of training. In addition to completed course work in optical mineralogy, specialized course work in PLM and asbestos identification by PLM is desirable. Experience is as important as education. A good laboratory training program can be used in place of course work. Analysts that are in training and not yet fully qualified should have all analyses checked by a qualified analyst before results are released. A QC Plan for asbestos identification would be considered incomplete without a detailed description of the analyst training program, together with detailed records of training for each analyst.

3.1.2 Instrument Calibration and Maintenance

Microscope alignment checks (alignment of the polarizer at 90° with respect to the analyzer, and coincident with the cross-lines, proper orientation of the slow vibration direction of the Red I compensator plate, image of the field diaphragm focussed in the plane of the specimen, centering of the central dispersion staining stop, etc.) should be performed with sufficient frequency to ensure proper operations. Liquids used for refractive index determination and those optionally used for dispersion staining should have periodic refractive index checks using a refractometer or known refractive index solids. These calibrations must be documented.

Microscopes and ancillary equipment should be maintained daily. It is recommended that at least once per year each microscope be thoroughly cleaned and re-aligned by a professional microscope service technician. Adequate inventories of replaceable parts

(illumination lamps, etc.) should be established and maintained. All maintenance must be documented.

3.2 Quality Control of Asbestos Analysis

3.2.1 Qualitative Analysis

All analysts must be able to correctly identify the six regulated asbestos types (chrysotile, amosite, crocidolite, anthophyllite, actinolite, and tremolite) using combined stereomicroscopic and PLM techniques. Standards for the six asbestos types listed are available from NIST, and should be used to train analysts in the measurement of optical properties and identification of asbestos. These materials can also be used as identification standards for XRD and AEM.

Identification errors between asbestos types (e.g. reporting amosite when tremolite is present) implies that the analyst cannot properly determine optical properties and is relying on morphology as the identification criteria. This is not acceptable. Each analyst in the lab should prove his or her proficiency in identifying the asbestos types; this can be checked through use of calibration materials (NVLAP proficiency testing materials, materials characterized by an independent technique, and synthesized materials) and by comparing results with another analyst. The identification of all parameters (e.g. refractive indices, birefringence, sign of elongation, etc.) leading to the identification should fall within control limits determined by the laboratory. In addition, a subset of materials should be analyzed using another technique to confirm the analysis.

As discussed earlier, the qualitative analysis is dependent upon matrix and asbestos type and texture. Therefore, the quality assurance system should monitor for samples that are difficult to analyze and develop additional or special steps to ensure accurate characterization of these materials. When an analyst is found to be out of the control limits defined by the laboratory, he or she should undergo additional training and have confirmatory analyses performed on all samples until the problem has been corrected.

3.2.2 Quantitative Analysis

The determination of the amount of asbestos in a sample can be accomplished using the various techniques outlined in this method. The mandatory stereomicroscopic and PLM examinations provide concentrations in terms of volume, area, or weight, depending upon the calibration procedure. Gravimetric and quantitative XRD techniques result in concentrations in units of weight percent. Specific guidelines for determining accuracy and precision using these techniques are provided in the appropriate sections of this method. In general, however, the accuracy of any technique is determined through analysis of calibration materials which are characterized by multiple independent techniques in order to provide an unbiased value for the analyte (asbestos) in question. The precision of any technique is determined by multiple analyses of the sample. The analyst is the detector for stereomicroscopic and PLM techniques, as opposed to gravimetric and XRD techniques, and therefore must be calibrated as an integral part of the procedure.

As in the qualitative analysis, the laboratory should determine its accuracy and precision for quantitative asbestos analysis according to the type of material analyzed and the technique used for analysis. For example, the laboratory may determine that its analysts have a problem with calibrated area estimates of samples containing cellulose and chrysotile and therefore needs to make or find special calibration materials for this class of sample.

Calibration materials for quantitative analysis of asbestos are available through the Bulk Asbestos NVLAP as proficiency testing materials for those laboratories enrolled in NVLAP. In a report provided following a test round, the concentration of asbestos in each sample is given in weight percent with 95%/95% tolerance limits, along with a description of the major matrix components. Materials from other round robin and quality assurance programs for asbestos analysis may not have been analyzed by independent techniques; the concentrations may represent consensus PLM results that could be significantly biased. Therefore, values from these programs should <u>not</u> be used as calibration materials for quantitative analysis.

Calibration materials for quantitative analysis can also be synthesized by mixing asbestos and appropriate matrix materials, as described in Appendix C of this method. These

materials are usually simplifications of "real world" samples; therefore the accuracy and precision determined from analysis of these materials are probably ideal.

Limits on permissible analytical variability must be established by the laboratory prior to QC implementation. It is recommended that a laboratory initially be at 100% quality control (all samples reanalyzed.) The proportion of quality control samples can later be lowered gradually, as control indicates, to a minimum of 10%. Quantitative results for standards including the mean and error estimate (typically 95% confidence or tolerance intervals) should be recorded. Over time these data can be used to help determine control limits for quality control charts.

The establishment and use of control charts is extensively discussed elsewhere in the literature. [1,2,3,4,5] Several cautions are in order:

- Control charts are based on the assumption that the data are distributed normally. Using rational subgrouping, the means of the subgroups are approximately normally distributed, irrespective of the distribution of the individual values in the subgroups. Control charts for asbestos analysis are probably going to be based on individual measurements, not rational subgroups. Check the data for normality before proceeding with the use of control charts. Ryan[8] suggests a minimum of 50 analyses before an attempt is made to establish control limits. However, for this analysis, consider setting "temporary" limits after accumulating 20-30 analyses of the sample.

- Include both prepared slides as well as bulk samples in your reference inventory.

- Make certain that sample quantities are sufficient to last, and that the act of sampling will not alter the composition of the reference sample.

Data on analytical variability can be obtained by having analysts repeat their analyses of samples and also by having different analysts analyze the same samples.

3.3 Interlaboratory Quality Control

The establishment and maintenance of an interlaboratory QC program is fundamental to continued assurance that the data produced within the laboratory are of consistent high quality. Intralaboratory programs may not be as sensitive to accuracy and precision error, especially if the control charts (see Section 3.2.2) for all analysts in the laboratory indicate small percent differences. A routine interlaboratory testing program will assist in the detection of internal bias and analyses may be performed more frequently than proficiency

testing. Arrangements should be made with at least two (preferably more) other laboratories that conduct asbestos identification by PLM. Samples (the number of which is left to the participating laboratories, but at least 4-10) representing the types of samples and matrices routinely submitted to the lab for analysis should be exchanged with sufficient frequency to determine intralaboratory bias. Both reference slides and bulk samples should be used. Results of the interlaboratory testing program should be evaluated by each of the participating laboratories and corrective actions, if needed, identified and implemented. Since quantitation problems are more pronounced at low concentrations ($\leq$ 5%), it would be prudent to include approximately 30-50% from this concentration range in the sample selection process.

3.4 Performance Audits

Performance audits are independent quantitative assessments of laboratory performance. These audits are similar to the interlaboratory QC programs established between several laboratories, but with a much larger cohort (the EPA Asbestos Bulk Sample Analysis Quality Assurance Program had as many as 1100 participating laboratories). Participation in this type of program permitted assessment of performance through the use of "consensus" test materials, and served to assist in assessing the bias relative to individual interlaboratory, as well as intralaboratory programs. Caution should be exercised in the use of "consensus" quantitation results, as they are likely to be significantly responsible for the propagation of high bias in visual estimates. The current NIST/NVLAP[9] for bulk asbestos laboratories (PLM) does not use concensus quantitation results. Results are reported in weight percent with a 95% tolerance interval. The American Industrial Hygiene Association (AIHA)[10] also conducts a proficiency testing program for bulk asbestos laboratories. Quantitation results for this program are derived from analyses by two reference laboratories and PLM, XRD and gravimetric analysis performed by Research Triangle Institute.

3.5 Systems Audits

Where performance audits are quantitative in nature, systems audits are qualitative. Systems audits are assessments of the laboratory quality system as specified in the Laboratory

Quality Assurance Manual. Such an audit might consist of an evaluation of some facet of the QA Manual, or the audit may be larger in scope. For example, the auditor might request specific laboratory data sheets which will be evaluated against written procedures for data recording in the laboratory. Or, the auditor might request air monitoring or contamination control data to review for frequency of sampling, analysis methodology, and/or corrective actions taken when problems were discovered. The audit report should reflect the nature of the audit as well as the audit results. Any recommendations for improvement should also be reflected in such a report.

3.6 References

1. **Quality Assurance for Air Pollution Measurement Systems. Volume I, Principles.** EPA-600/9-76-005, March, 1976.

2. Juran, J. and F. Gryna, **Quality Planning Analysis,** 2nd edition, McGraw-Hill, Inc., 1980.

3. Taylor, J.R., **Quality Control Systems,** McGraw Hill, Inc., 1989.

4. Ratliff, T.A., **The Laboratory Quality Assurance System,** Van Nostrand Reinhold, 1990.

5. Taylor, J.K., **Quality Assurance of Chemical Measurements,** Lewis Publishers, 1987.

6. Bulk Asbestos Handbook, National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program, NISTIR 88-3879, October 1988.

7. Harvey, B.W., "Classification and Identification Error Tendencies in Bulk Insulation Proficiency Testing Materials," **American Environmental Laboratory, 2**(2), 4/90, pp. 8-14.

8. Ryan, T.P., **Statistical Techniques for Quality Improvement,** John Wiley & Sons, Inc., New York, 1989.

9. National Institute of Standards & Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP), Building 411, Room A124, Gaithersburg, MD 20899, telephone (301) 975-4016.

10. American Industrial Hygiene Association (AIHA), 2700 Prosperity Avenue, Suite 250, Fairfax, VA 22031, (703) 849-8888.

APPENDIX A

Glossary Of Terms

APPENDIX A. GLOSSARY OF TERMS

Accuracy The degree of agreement of a measured value with the true or expected value.

Anisotropic Refers to substances that have more than one refractive index (e.g. are birefringent), such as nonisometric crystals, oriented polymers, or strained isotropic substances.

Asbestiform (morphology) Said of a mineral that is like asbestos, i.e., crystallized with the habit of asbestos. Some asbestiform minerals may lack the properties which make asbestos commercially valuable, such as long fiber length and high tensile strength. With the light microscope, the asbestiform habit is generally recognized by the following characteristics:

- Mean aspect ratios ranging from 20:1 to 100:1 or higher for fibers longer than 5μm. Aspect ratios should be determined for fibers, not bundles.
- Very thin fibrils, usually less than 0.5 micrometers in width, and
- Two or more of the following:

  Parallel fibers occurring in bundles,

  Fiber bundles displaying splayed ends,

  Matted masses of individual fibers, and/or

  Fibers showing curvature

These characteristics refer to the population of fibers as observed in a bulk sample. It is not unusual to observe occasional particles having aspect ratios of 10:1 or less, but it is unlikely that the asbestos component(s) would be dominated by particles (individual fibers) having aspect ratios of $<20:1$ for fibers longer than 5μm. If a sample contains a fibrous component of which most of the fibers have aspect ratios of $<20:1$ and that do not display the additional asbestiform characteristics, by definition the component should not be considered asbestos.

Asbestos - A commercial term applied to the asbestiform varieties of six different minerals. The asbestos types are chrysotile (asbestiform serpentine), amosite (asbestiform grunerite), crocidolite (asbestiform riebeckite), and asbestiform anthophyllite, asbestiform tremolite, and asbestiform actinolite. The properties of asbestos that caused it to be widely used commercially are: 1) its ability to be separated into long, thin, flexible fibers; 2) high tensile strength; 3) low thermal and electrical conductivity; 4) high mechanical and chemical durability, and 5) high heat resistance.

Becke Line - A band of light seen at the periphery of a specimen when the refractive indices of the specimen and the mounting medium are different; it is used to determine refractive index.

Bias - A systematic error characterized by a consistent (non-random) measurement error.

Binder - With reference to a bulk sample, a component added for cohesiveness (e.g. plaster, cement, glue, etc.).

Birefringence - The numerical difference between the maximum and minimum refractive indices of an anisotropic substance. Birefringence may be estimated, using a Michel-Levy chart, from the interference colors observed under crossed polarizers. Interference colors are also dependent on the orientation and thickness of the grain, and therefore are used qualitatively to determine placement in one of the four categories listed below.

Qualitative	Quantitative(N-n)
none	0.00 or isotropic
low	$\leq$0.010
moderate	0.011-0.050
high	>0.050

Bulk Sample - A sample of building material taken for identification and quantitation of asbestos. Bulk building materials may include a wide variety of friable and nonfriable materials.

Bundle - Asbestos structure consisting of several fibers having a common axis of elongation.

Calibration Materials - Materials, such as known weight % standards, that assist in the calibration of microscopists in terms of ability to quantitate the asbestos content of bulk materials.

Color - The color of a particle or fiber when observed in plane polarized light.

Compensator - A device with known, fixed or variable retardation and vibration direction used for determining the degree of retardation (hence the thickness or value of birefringence) in an anisotropic specimen. It is also used to determine the sign of elongation of elongated materials. The most common compensator is the first-order red plate (530-550nm retardation).

Control Chart - A graphical plot of test results with respect to time or sequence of measurement, together with limits within which they are expected to lie when the system is in a state of statistical control.

Detection Limit The smallest concentration/amount of some component of interest that can be measured by a single measurement with a stated level of confidence.

Dispersion Staining (focal masking) An optical means of imparting apparent or virtual color to transparent substances by the use of stops in the objective back focal plane; ir it is used to determine refractive indices.

Error Difference between the true or expected value and the measured value of a quantity or parameter.

Extinction The condition in which an anisotropic substance appears dark when observed between crossed polars. This occurs when the vibration directions in the specimen are parallel to the vibration directions in the polarizer and analyzer. Extinction may be complete or incomplete; common types include parallel, oblique, symmetrical and undulose.

Extinction Angle For fibers, the angle between the extinction position and the position at which the fiber is parallel to the polarizer or analyzer privileged directions.

Fiber With reference to asbestiform morphology, a structure consisting of one or more fibrils.

Fibril The individual unit structure of fibers.

Friable Refers to the cohesiveness of a bulk material, indicating that it may be crumbled or disaggregated by hand pressure.

Gravimetry Any technique in which the concentration of a component is determined by weighing. As used in this document, it refers to measurement of asbestos-containing residues after sample treatment by ashing, dissolution, etc.

Homogeneous Uniform in composition and distribution of all components of a material, such that multiple subsamples taken for analysis will contain the same components in approximately the same relative concentrations.

Heterogeneous Lacking uniformity in composition and/or distribution of material; components not uniform. Does not satisfy the conditions stated for homogenous; e.g., layered or in clumps, very coarse grained, etc.

Isotropic Refers to substances that have a single refractive index such as unstrained glass, un-oriented polymers and unstrained substances in the isometric crystal system.

Lamda Zero (λ_0) The wavelength (λ_0) of the dispersion staining color shown by a specimen in a medium; both the specimen and medium have the same refractive index at that wavelength.

Matrix Nonasbestos, nonbinder components of a bulk material. Includes such components as cellulose, fiberglass, mineral wool, mica, etc.

Michel-Levy Scale of Retardation colors A chart plotting the relationship between birefringence, retardation and thickness of anisotropic substances. Any one of the three variables can be determined if the other two are known.

Morphology The structure and shape of a particle. Characterization may be descriptive (platy, rod-like, acicular, etc) or in terms of dimensions such as length and diameter (see asbestiform).

Pleochroism The change in color or hue of colored anisotropic substance when rotated relative to the vibration direction of plane polarized light.

Point Counting A technique used to determine the relative projected areas occupied by separate components in a microscope slide preparation of a sample. For asbestos analysis, this technique is used to determine the relative concentrations of asbestos minerals to nonasbestos sample components.

Polarization Colors Interference colors displayed by anisotropic substances between two polarizers. Birefringence, thickness and orientation of the material affect the colors and their intensity.

Precision The degree of mutual agreement characteristic of independent measurements as the result of repeated application of the process under specified conditions. It is concerned with the variability of results.

Reference Materials Bulk materials, both asbestos-containing and nonasbestos-containing, for which the components are well-documented as to identification and quantitation.

Refractive Index (index of refraction) The ratio of the velocity of light in a vacuum relative to the velocity of light in a medium. It is expressed as n and varies with wavelength and temperature.

Sign of Elongation Referring to the location of the high and low refractive indices in an elongated anisotropic substance, a specimen is described as positive when the higher refractive index is lengthwise (length slow), and as negative when the lower refractive index is lengthwise (length fast).

Standard Reference Material (SRM) A reference material certified and distributed by the National Institute of Standards and Technology.

Visual Estimate An estimation of concentration of asbestos in a sample as compared to the other sample components. This may be a volume estimate made during stereomicroscopic examination and/or a projected area estimation made during microscopic (PLM) examination.

APPENDIX B

Apparatus For Sample Preparation And Analysis

B1.0 INTRODUCTION

The following lists the apparatus and materials required and suggested for the methods of sample preparation and analysis described in the test method.[1,2,3]

B2.0 STEREOMICROSCOPIC EXAMINATION

The following are suggested for routine stereomicroscopic examination.

- HEPA-filtered hood or class 1 biohazard hood, negative pressure
- Microscope: binocular microscope, preferably stereoscopic, 5-60X magnification (approximate)
- Light source: incandescent or fluorescent
- Tweezers, dissecting needles, scalpels, probes, etc. (for sample manipulation)
- Glassine paper, glass plates, weigh boats, petri dishes, watchglasses, etc. (sample containers)

The following are suggested for sample preparation.

- Mortar and pestle, silica or porcelain-glazed
- Analytical balance (readability less than or equal to one milligram) (optional)
- Mill or blender (optional)

B3.0 POLARIZED LIGHT MICROSCOPY

The laboratory should be equipped with a polarized light microscope (preferably capable of Köhler or Köhler-type illumination if possible) and accessories as described below.

- Ocular(s) binocular or monocular with cross hair reticle, or functional equivalent, and a magnification of at least 8X
- 10X, 20X, and 40X objectives, (or similar magnification)

- Light source (with optional blue "day-light" filter)
- 360-degree rotatable stage
- Substage condenser with iris diaphragm
- Polarizer and analyzer which can be placed at 90 degrees to one another, and can be calibrated relative to the cross-line reticle in the ocular.
- Accessory slot for wave plates and compensators (or demonstrated equivalent).
- Wave retardation plate (Red I compensator) with approximately 550 nanometer retardation, and with known slow and fast vibration directions.
- Dispersion staining objective or a demonstrated equivalent. (optional)
- Monochromatic filter (n_D), or functional equivalent. (optional)

In addition, the following equipment, materials and reagents are required or recommended.[1]

- NIST traceable standards for the major asbestos types (NIST SRM 1866 and 1867)
- Class I biohazard hood or better (see "Note", Section 2.2.5)
- Sampling utensils (razor knives, forceps, probe needles, etc.)
- Microscope slides and cover slips
- Mechanical Stage
- Point Counting Stage (optional)
- Refractive index liquids: 1.490-1.570, 1.590-1.720 in increments of less than or equal to 0.005; high dispersion, (HD) liquids are optional; however, if using dispersion staining, HD liquids are recommended.
- Mortar and pestle
- Distilled water
- HCl, ACS reagent grade concentrated

- Muffle furnace (optional)
- Mill or blender (optional)
- Beakers and assorted glassware (optional)
- Other reagents (tetrahydrofuran, amyl acetate, acetone, sodium hexametaphosphate, etc.) (optional)

B4.0 GRAVIMETRY

The following equipment, materials, and reagents are suggested.

- Scalpels
- Crucibles, silica or porcelain-glazed, with lids
- Muffle furnace temperature range at least to 500°C, temperature stable to $\pm$ 10°C, temperature at sample position calibrated to $\pm$ 10°C
- Filters, 0.4 μm pore size polycarbonate
- Petri dishes
- Glass filtration assembly, including vacuum flask, water aspirator, and/or air pump
- Analytical balance, readable to 0.001 gram
- Mortar and pestle, silica or porcelain-glazed
- Heat lamp or slide warmer
- Beakers and assorted glassware
- Centrifuge, bench-top
- Class I biohazard hood or better
- Bulb pipettes
- Distilled water
- HCl, reagent-grade concentrated

- Organic solvents (tetrahydrofuran, amyl acetate,etc)
- Ultrasonic bath

B5.0 X-RAY DIFFRACTION

Sample Preparation

Sample preparation apparatus requirements will depend upon the sample type under consideration and the kind of XRD analysis to be performed.

- Mortar and pestle: agate or porcelain
- Razor blades
- Sample mill: SPEX, Inc., freezer mill or equivalent
- Bulk sample holders
- Silver membrane filters: 25-mm diameter, 0.45-μm pore size. Selas Corp. of America, Flotronics Div., 1957 Pioneer Road, Huntington Valley, PA 19006
- Microscope slides
- Vacuum filtration apparatus: Gelman No. 1107 or equivalent, the side-arm vacuum flask
- Microbalance
- Ultrasonic bath or probe: Model W140, Ultrasonics, Inc., operated at a power density of approximately 0.1 W/mL, or equivalent
- Volumetric flasks: 1-L volume
- Assorted pipets
- Pipet bulb
- Nonserrated forceps
- Polyethylene wash bottle
- Pyrex beakers: 50-mL volume

- Desiccator
- Filter storage cassettes
- Magnetic stirring plate and bars
- Porcelain crucibles
- Muffle furnace or low temperature asher
- Class 1 biohazard hood or better

Sample Analysis

Sample analysis requirements include an x-ray diffraction unit, equipped with:

- Constant potential generator; voltage and mA stabilizers
- Automated diffractometer with step-scanning mode
- Copper target x-ray tube: high intensity; fine focus, preferably
- X-ray pulse height selector
- X-ray detector (with high voltage power supply): scintillation or proportional counter
- Focusing graphite crystal monochromator; or nickel filter (if copper source is used, and iron fluorescence is not a serious problem)
- Data output accessories:
  Strip chart recorder
  Decade scaler/timer
  Digital printer

  or

  PC, appropriate software and Laser Jet Printer
- Sample spinner (optional)
- Instrument calibration reference specimen: α-quartz reference crystal (Arkansas quartz standard, #180-147-00, Philips Electronics Instruments, Inc., 85 McKee Drive, Mahwah, NJ 07430) or equivalent.

Reagents, etc.

Reference Materials The list of reference materials below is intended to serve as a guide. Every attempt should be made to acquire pure reference materials that are comparable to sample materials being analyzed.

- Chrysotile: UICC Canadian, NIST SRM 1866 (UICC reference material available from: UICC, MRC Pneumoconiosis Unit, Llandough Hospital, Penarth, Glamorgan, CF61XW, UK); (NIST Standard Reference Materials available from the National Institute of Standards and Technology, Office of Reference Standards, Gaithersburg, MD 20899)

- Crocidolite: UICC, NIST SRM 1866.

- "Amosite": UICC, NIST SRM 1866.

- Anthophyllite-Asbestos: UICC, NIST SRM 1867

- Tremolite Asbestos: Wards Natural Science Establishment, Rochester, NY; Cyprus Research Standard, Cyprus Research, 2435 Military Ave., Los Angeles, CA 900064 (washed with dilute HCl to remove small amount of calcite impurity); Indian tremolite, Rajasthan State, India; NIST SRM 1867.

- Actinolite Asbestos: NIST SRM 1867

Adhesive Tape, petroleum jelly, etc. (for attaching silver membrane filters to sample holders).

Surfactant 1 Percent aerosol OT aqueous solution or equivalent.

Isopropanol ACS Reagent Grade.

B6.0 ANALYTICAL ELECTRON MICROSCOPY

AEM equipment requirements will not be discussed in this document; it is suggested that equipment requirements stated in the AHERA regulations be followed. Additional information may be found in the NVLAP Program Handbook for Airborne Asbestos Analysis.[3]

The following additional materials and equipment are suggested:

- Analytical balance, readable to 0.001 gram
- Ultrasonic bath
- Glass filtration assembly (25mm), including vacuum flask and water aspirator
- Mixed cellulose ester (MCE) filters (0.22μm pore size) or 0.2μm pore size polycarbonate filters
- MCE backing filters (5μm pore size)
- Silica mortar and pestle
- Beakers glass and disposable
- Pipettes, disposable, 1,5, and 10 ml

B7.0 REFERENCES

1. National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) Bulk Asbestos Handbook, NISTIR 88-3879, 1988.
2. **Interim Method for the Determination of Asbestos in Bulk Insulation Samples**, U.S. E.P.A. 600/M4-82-020, 1982.
3. National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) Program Handbook for Airborne Asbestos Analysis, NISTIR 89-4137, 1989.

APPENDIX C

Preparation and Use of Bulk Asbestos
Calibration Standards

C1.0 INTRODUCTION

Evaluation of the results from national proficiency testing programs for laboratories analyzing for asbestos in bulk materials indicates that laboratories have had, and continue to have, problems with quantitation of asbestos content, especially with samples having a low asbestos concentration.[1] For such samples, the mean value of asbestos content reported by laboratories may be four to ten times the true weight percent value. It is assumed that the majority of the laboratories quantify asbestos content by visual estimation, either stereomicroscopically or microscopically; therefore, the problem of quantitation must be attributed to lack of or inadequate calibration of microscopists.

As calibration standards for asbestos-containing bulk materials are not currently commercially available, laboratories should consider generating their own calibration materials. This may be done rather easily and inexpensively.

C2.0 MATERIALS AND APPARATUS

Relatively pure samples of asbestos minerals should be obtained. Chrysotile, amosite and crocidolite (SRM 1866) and anthophyllite, tremolite and actinolite (SRM 1867) are available from NIST. A variety of matrix materials are commercially available; included are calcium carbonate, perlite, vermiculite, mineral wool/fiberglass, and cellulose. Equipment, and materials needed to prepare calibration bulk materials are listed below.

- Analytical balance, readable to 0.001 gram
- Blender/mixer; multi-speed, ~ one quart capacity
- Filtration assembly, including vacuum flask, water aspirator and/or air pump (optional)
- HEPA-filtered hood with negative pressure
- Filters, 0.4μm pore size polycarbonate (optional)
- Beakers and assorted glassware, weigh boats, petri dishes, etc.
- Hot/warm plate

- Asbestos minerals
- Matrix materials
- Distilled water.

C3.0 MATERIAL FORMULATION PROCEDURES

The formulation procedure involves first weighing appropriate quantities of asbestos and matrix material to give the desired asbestos weight percent. The following formula may be used to determine the weights of asbestos and matrix materials needed to give a desired weight percent asbestos.

$$\frac{WTa}{Wa} = \frac{WTm}{Wm}$$

Where:

WTa = weight of asbestos in grams (to 0.001 gram)
WTm = weight of matrix materials in grams (to 0.001 gram)
Wa = weight percent asbestos
Wm = weight percent matrix

Example: The desired total weight for the calibration sample is ~ 10 grams containing 5% asbestos by weight. If 0.532 grams of asbestos are first weighed out, what corresponding weight of matrix material is required?

WTa = 0.532 grams
Wa = 5%
Wm = 95%

$$\frac{0.532}{5} = \frac{WTm}{95}$$

Then: WTm = 10.108 grams

The matrix is then placed into the pitcher of a standard over-the-counter blender, the pitcher being previously filled to approximately one-fourth capacity (8-10 ounces) with distilled water. Blending is performed at the lowest speed setting for approximately ten seconds which serves to disaggregate the matrix material. The asbestos is then added, with additional blending of approximately 30 seconds, again at the lowest speed setting. Caution should be taken not to overblend the asbestos-matrix mixture. This could result in a significant reduction in the size of the asbestos fibers causing a problem with detection at normal magnification during stereomicroscopic and microscopic analyses. Ingredients of the

pitcher are then poured into a filtering apparatus, with thorough rinsing of the pitcher to ensure complete material removal. After filtering, the material is transferred to a foil dish which is placed on a hot plate. The material is covered and allowed to sit over low heat until drying is complete; intermittent stirring will speed the drying process. For fine-grained matrix materials such as gypsum, calcium carbonate, clays, etc., the sample is not filtered after the blending process. Instead, the ingredients in the pitcher are transferred into a series of shallow, glass (petri) dishes. The ingredients should be stirred well between each pouring to minimize the possible settling (and over-representation) of some components. The dishes are covered and placed on a hot plate until the contents are thoroughly dried. For small quantities of any matrix materials (15 grams or less), air-drying without prior filtering is generally very suitable for removing water from the prepared sample. For each material, the final step involves placing all formulated, dried subsamples into a plastic bag (or into one petri dish, for small quantities), where brief hand-mixing will provide additional blending and help to break up any clumps produced during drying. **All operations should be performed in a safety-hood with negative pressure.**

C4.0 ANALYSIS OF MATERIALS

All formulations should be examined with the stereomicroscope to determine homogeneity. Gravimetric analysis (ashing and/or acid dissolution) should be performed on those materials containing organic and/or acid-soluble components. Matrix materials to which no asbestos has been added should be analyzed by gravimetric analysis to determine the amount of nonashable or insoluble materials that are present. Several subsamples of each material should be analyzed by the gravimetric technique to provide information concerning the uniformity of the prepared materials. Experience has shown that the previously described formulation procedure results in relatively homogeneous materials.[2]

C4.1 Stereomicroscopic Analysis

Visual estimation of sample components using the stereomicroscope is in reality a comparison of the relative volumes of the components.[3] Therefore, differences in specific gravity between asbestos and matrix material must be considered and the relationship

between weight percent and volume percent must be determined.[4] Materials such as expanded vermiculite, perlite, and cellulose have specific gravities significantly lower than asbestos minerals. Table C1 lists the specific gravities for the three most commonly encountered asbestos varieties and several common matrix materials.

TABLE C1. SPECIFIC GRAVITIES OF ASBESTOS VARIETIES AND MATRIX MATERIALS

Asbestos Type	Specific Gravity	Matrix Type	Specific Gravity
Chrysotile	2.6	Calcium Carbonate	2.7
		Gypsum	2.3
Amosite	3.2	Perlite	~0.4
		Vermiculite (expanded)	~0.3
		Mineral Wool	~2.5
Crocidolite	3.3	Fiberglass	~2.5
		Cellulose	~0.9

The conversion of weight percent asbestos to equivalent volume percent asbestos is given by the following formula:

$$\frac{\frac{Wa}{Ga}}{\frac{Wa}{Ga} + \frac{Wm}{Gm}} \times 100 = Va$$

where:

Wa = weight percent asbestos
Ga = specific gravity of asbestos
Wm = weight percent matrix
Gm = specific gravity of matrix
Va = volume percent asbestos

Example: Chrysotile and perlite have been combined to form a 5% asbestos calibration standard, by weight. What is the equivalent volume percent asbestos?

$Wa = 5\%$
$Ga = 2.6$
$Wm = 95\%$
$Gm = 0.4$

$$Va = \frac{\frac{5}{2.6}}{\frac{5}{2.6} + \frac{95}{0.4}} \times 100 = 0.8\%$$

Conversely, to convert volume percent asbestos to equivalent weight percent, the following formula may be used.

$$\frac{(Va)(Ga)}{(Va)(Ga)+(Vm)(Gm)} \times 100 = Wa$$

Vm = volume percent matrix

Example: A calibration standard consisting of amosite and cellulose is estimated to contain 2% asbestos, by volume. What is the equivalent weight percent asbestos?

$Va = 2\%$
$Ga = 3.2$
$Vm = 98\%$
$Gm = 0.9$

$$Wa = \frac{(2)(3.2)}{(2)(3.2)+(98)(0.9)} \times 100 = 6.77\%$$

Volume percentages should be calculated for all calibration materials prepared so that visual estimates determined by examination with the stereomicroscope may be compared to true volume concentrations.

Figure C1 illustrates the relationship between volume percent and weight percent of chrysotile mixed with vermiculite and cellulose respectively. It should be noted that when asbestos in a low weight percentage is mixed with matrix materials having low specific gravities (vermiculite, perlite), the resulting volume concentration of asbestos is very low For example, a mixture containing three percent chrysotile by weight in a cellulose matrix would result in a volume percent asbestos of approximately 1.1%; in a vermiculite matrix, the resulting volume percent asbestos would be approximately 0.4%. In the latter case especially, an analyst might possibly fail to detect the asbestos or consider it to be present in only trace amounts.

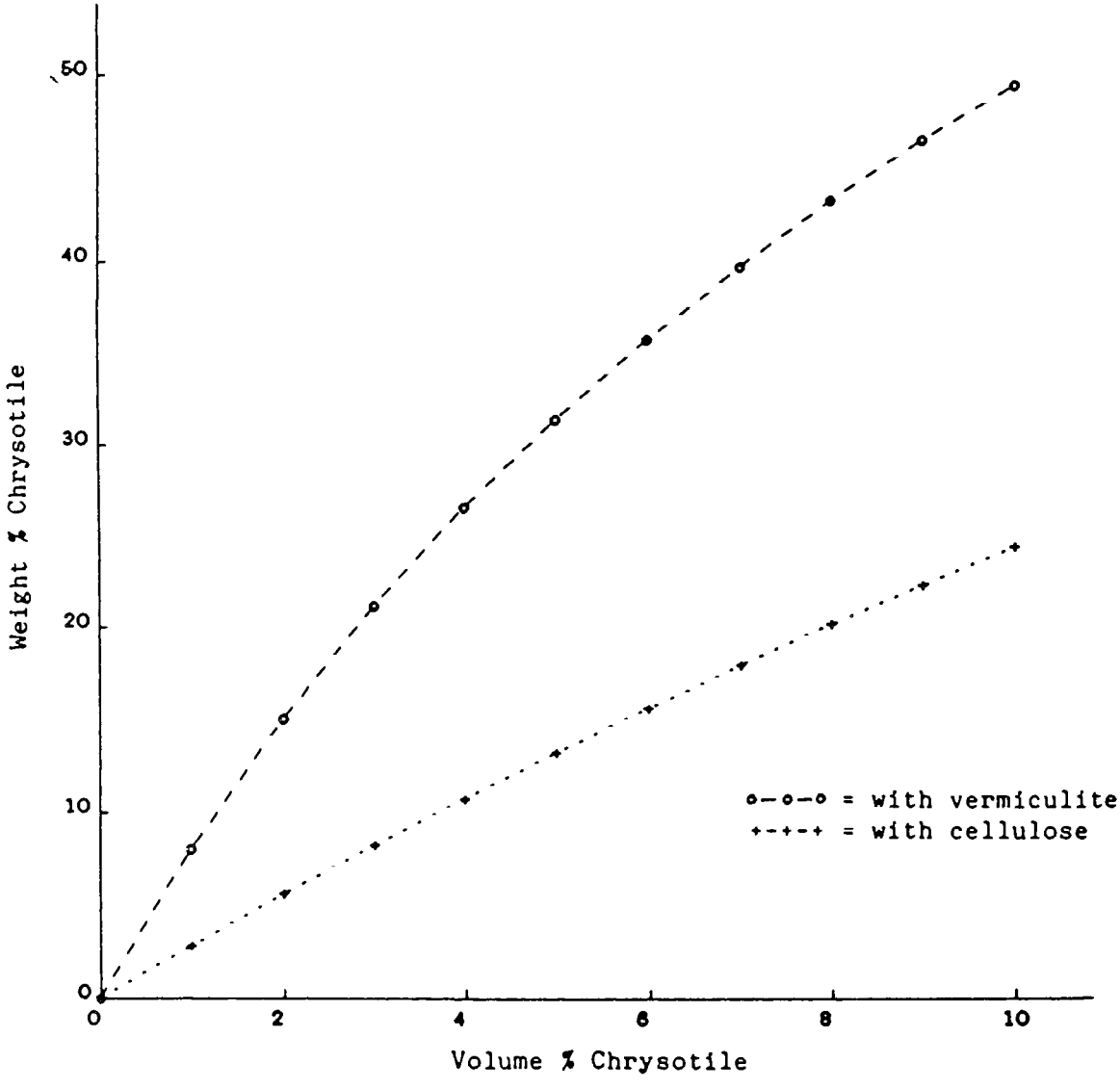


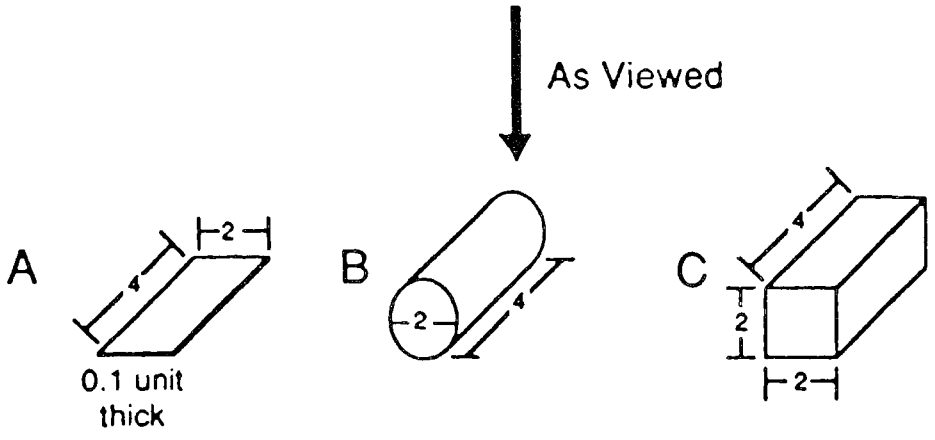
Figure C1. Relationship between volume % and weight % of chrysotile mixed with a)vermiculite and b) cellulose.

C4.2 Microscopical Analysis (PLM)

The polarized light microscope may be used to quantify asbestos and other components of a sample. Slide mounts are prepared from "pinch" samples of the calibration material and asbestos content is determined by visual area estimate and/or point counting. Both of these quantitation techniques are in fact estimates or measurements of the relative projected areas of particles as viewed in two dimensions on a microscope slide. For quantitation results to be meaningful, the following conditions should be met:

- The sample should be homogeneous for slide preparations, which are made from small pinches of the sample, to be representative of the total sample.
- Slide preparation should have an even distribution of particles and approach a one particle thickness (seldom achieved) to avoid particle overlap.
- All materials used should be identified and specific gravities determined in order to relate area percent to volume and/or weight percent.
- The size (thickness) relationship between matrix particles and asbestos fibers should be determined if the results based on projected area are to be related to volume and/or weight percent.

Particle characteristics can greatly affect the quantitation results obtained by visual area estimation or point counting. Figure C2 illustrates three hypothetical particle shapes of identical length and width (as viewed from above). Although the three-dimensional shape is different, the projected area is equal for all particles. The table accompanying Figure C2 presents data for each particle in terms of thickness, volume and projected area. It should be noted that although the projected areas may be equal, the volumes represented by the particles may vary by a factor of 20(0.8 vs 16 cubic units). It is obvious that quantitation of a sample consisting of a mixture of particles with widely ranging particle thicknesses could result in different results. For example, if a sample contained relatively thick bundles of asbestos and a fine-grained matrix such as clay or calcium carbonate, the true asbestos content (by volume) would likely be underestimated. Conversely, if a sample contained thick "books" of mica and thin bundles of asbestos, the asbestos content (by volume) would likely be overestimated.



Particle	Thickness	Volume	Projected Area
A	0.1 units	0.8 cubic units	8 sq. units
B	2 units	12.6 cubic units	8 sq. units
C	2 units	16 cubic units	8 sq. units

Note that although all particles have the same projected area, particle C volume is 20x that of particle A.

Figure C2. Relationship of projected area to volume and thickness for three different particles as viewed on a slide mount.

Table C2 illustrates several examples of expected results from area estimates or point counting of samples in which the asbestos fibers and matrix particles differ in thickness.

TABLE C2. RELATIONSHIP OF WEIGHT PERCENT, VOLUME PERCENT AND PARTICLE THICKNESS TO QUANTITATION RESULTS

Composition of Sample In Wt. %	Theoretical Vol. % Asbestos	Thickness Factor* (Matrix/Asbestos)	Expected Area %
1% Amosite 99% Calcium Carbonate	0.9	0.5	0.4
1% Amosite 99% Calcium Carbonate	0.9	1	0.9
1% Amosite 99% Calcium Carbonate	0.9	2	1.8
1% Amosite 99% Vermiculite	0.1	1	0.1
1% Amosite 99% Vermiculite	0.1	10	1.0
1% Amosite 99% Vermiculite	0.1	20	2.0
1% Amosite 99% Vermiculite	0.1	30	2.9

* Value represents the relationship between the mean thickness of the matrix particles compared to the mean thickness of the asbestos particles.

It should be noted that it is not uncommon for matrix particle thickness to differ greatly from asbestos fiber thickness, especially with matrix materials such as vermiculite and perlite; vermiculite and perlite particles may be 20 - 30 times as thick as the asbestos fibers.

The general size relationships between matrix particles and asbestos fibers may be determined by scanning slide mounts of a sample. A micrometer ocular enables the microscopist to actually measure particle sizes.

If a thickness factor can be determined for a calibration sample of known volume proportions of asbestos and matrix materials, an expected equivalent projected area asbestos can be calculated using the following formula:

$$\frac{Va}{\frac{Vm}{T} + Va} \times 100 = Aa$$

where:

Va = true volume percent asbestos
Vm = true volume percent matrix
T = thickness factor (mean size matrix particle/mean size asbestos fiber)
Aa = expected projected area percent asbestos

Example: A calibration standard of known weight percent asbestos is determined, by factoring in component specific gravities, to be 5.0% asbestos by volume. The matrix particles are estimated to be ten times thicker than the asbestos fibers. What would be the expected projected area percentage of asbestos?

Va = 5%
Vm = 95%
T = 10

$$Aa = \frac{5}{\frac{95}{10} + 5} \times 100 = 34.5\%$$

Conversely, to convert projected area percent asbestos to equivalent volume percent, the following formula may be used:

$$\frac{Aa}{T(Am) + Aa} \times 100 = Va$$

Where: Am = projected area matrix

Example: A slide containing a subsample of an amosite/mineral wool calibration standard is determined by point counting to have a projected area asbestos of 18.6%. If the mineral wool fibers are estimated to be six times the asbestos fibers, in diameter, what is the equivalent volume percent asbestos?

Am = 81.4%
Aa = 18.6%
T = 6

$$Va = \frac{(18.6)}{6(81.4) + 18.6} \times 100 = 3.67\%$$

Based on specific gravity values listed in Table 1C and on the above volume asbestos determination, what is the equivalent weight percent asbestos in the sample?

Va = 3.67%
Ga = 3.2
Vm = 96.33%
Gm = 2.5

$$Wa = \frac{(3.67)(3.2)}{(3.67)(3.2) + (96.33)(2.5)} \times 100 = 4.7\%$$

C5.0 USE OF CALIBRATION STANDARDS FOR QA/QC

Once the materials have been formulated and thoroughly characterized by all techniques to determine their suitability as calibration standards, a system for incorporating them into the QA/QC program should be established. Someone should be designated (QA officer, lab supervisor, etc.) to control the distribution of standards and to monitor the analysis results of the microscopists. Both precision and accuracy may be monitored with the use of suitable standard sets.

Records such as range charts, control charts, etc. may be maintained for volume (stereomicroscopic estimates), area (PLM) estimates and point counts. For point counts and area estimates, relatively permanent slides may be made using epoxy or Melt Mount ®. Such slides may be very accurately quantified over time as to point count values, and due to their very long shelf life, may be used for QA/QC purposes almost indefinitely.

C6.0 REFERENCES

1. "Analysis Summaries for Samples used in NIST Proficiency Testing", National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) for Bulk Asbestos, January 1989 to present.

2. Harvey, B. W., R. L. Perkins, J. G. Nickerson, A. J. Newland and M. E. Beard, "Formulating Bulk Asbestos Standards", **Asbestos Issues**, April 1991.

3. Perkins, R. L. and M. E. Beard, "Estimating Asbestos Content of Bulk Materials", **National Asbestos Council Journal**, Vol. 9, No. 1, 1991, pp. 27-31.

4. **Asbestos Content in Bulk Insulation Samples: Visual Estimates and Weight Composition**, U.S. Environmental Protection Agency 560/5-88-011, 1988.

APPENDIX D

Special-Case Building Materials

Asbestos laboratories are now called upon to analyze many types of bulk building materials that are very difficult to characterize by routine PLM analysis. These materials are dominantly nonfriable and can be grouped into the following categories:

- Cementitious Products (pipe, sheeting, etc.)
- Viscous Matrix Products (adhesives, cements, coatings, etc.)
- Vinyl Materials (vinyl floor tile, sheeting)
- Asphaltic Roofing Materials (shingles, roll roofing)
- Miscellaneous Products (paints, coatings, friction plates, gaskets, etc.)

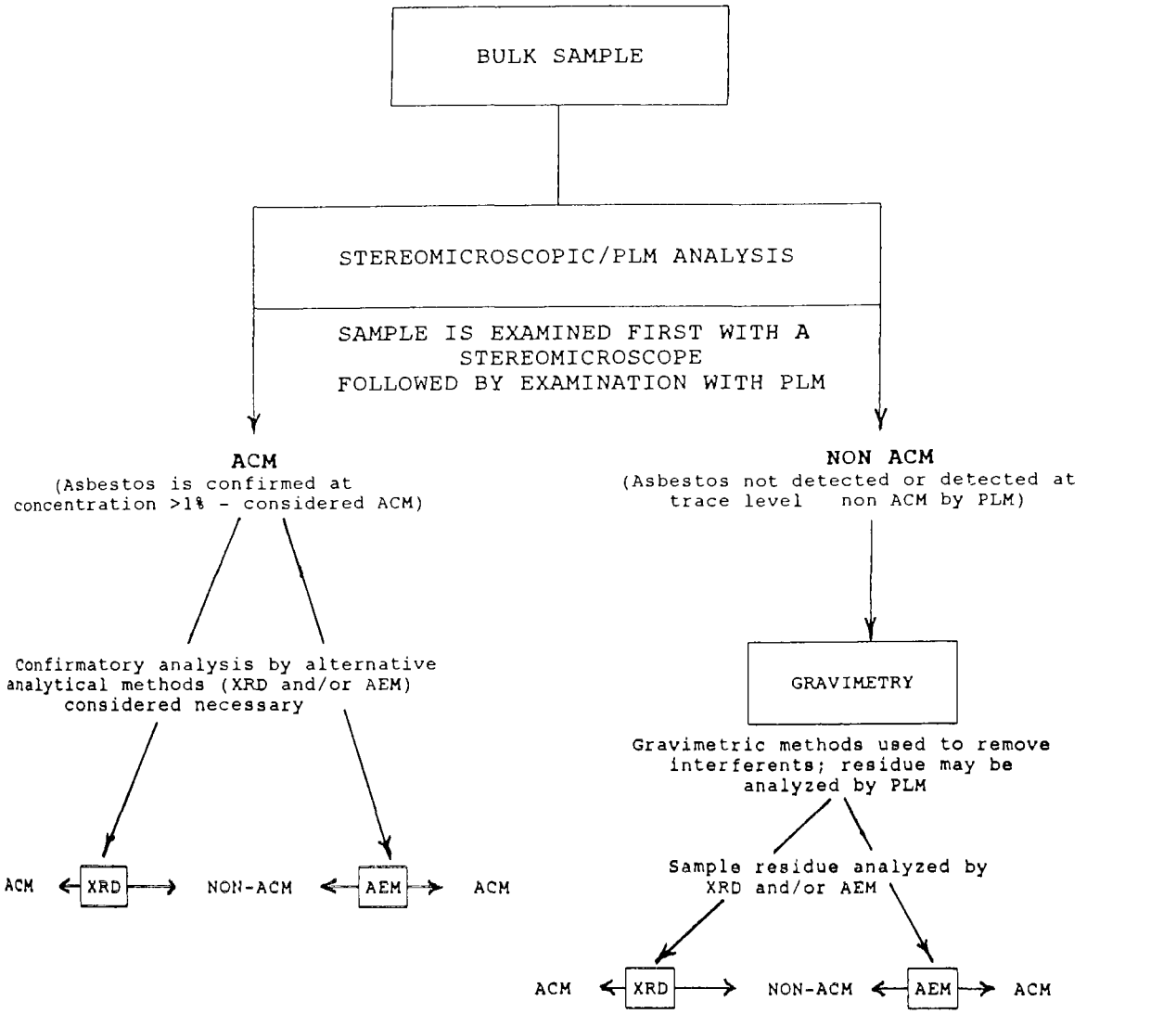
Materials characterized by interfering binder/matrix, low asbestos content, and/or small fiber size may require that additional sample treatment(s) and analysis be performed beyond routine PLM analysis. The sample treatment(s) required is(are) determined by the dominant nonasbestos sample components (see Section 2.3, Gravimetry). Materials containing an appreciable amount of calcareous material may be treated by dissolution with hydrochloric acid. Samples containing organic binders such as vinyl, plasticizers, esters, asphalts, etc. can be treated with organic solvents or ashed in a muffle furnace (preferred method) or low temperature plasma asher to remove unwanted components. Materials containing cellulose, synthetic organic fibers, textiles, etc. may also be ashed in a muffle furnace or low temperature plasma asher.

The method chosen for analysis of a sample after treatment is dependent on asbestos concentration and/or fiber size. An examination of the sample residue by PLM may disclose asbestos if the fibers are large enough to be resolved by the microscope, but additional analytical methods are required if the sample appears negative. Analysis by XRD is not fiber-size dependent, but may be limited by low concentration of asbestos and the presence of interfering mineral phases. In addition, the XRD method does not differentiate between fibrous and nonfibrous varieties of a mineral. Analysis by AEM is capable of providing positive identification of asbestos type(s) and semi-quantitation of asbestos content.

The following flowchart illustrates a possible scheme for the analysis of special-case building materials.

NOTE: Preliminary studies indicate that the XRD method is capable of detecting serpentine (chrysotile) in floor tile samples without extensive sample preparation prior to XRD analysis. XRD analysis of small, intact sections of floor tile yielded diffraction patterns that confirmed the presence of serpentine, even at concentrations of ~one percent by weight. TEM analysis of these same tiles confirmed the presence of chrysotile asbestos. With further investigation, this method may prove applicable to other types of nonfriable materials.

FLOWCHART FOR QUALITATIVE ANALYSIS OF SPECIAL CASE BUILDING MATERIALS SUCH AS FLOOR TILES, ASPHALTIC MATERIALS, VISCOUS MATRIX MATERIALS, ETC.*



*Although this flowchart is applicable to all bulk materials, it is primarily intended to be used with known problem materials that are difficult to analyze by PLM due to low asbestos concentration, and/or small fiber size, and/or interfering binder/matrix. In addition to being qualitative, the results may also be semi-quantitative. It should not be assumed that all samples need to be analyzed by AEM and XRD. The flowchart simply illustrates options for methods of analysis. Alternate methods such as SEM may be applicable to some bulk materials.

*U S GOVERNMENT PRINTING OFFICE 1993 -750 -002/ 80237

AMEND: 340-248-0210

RULE TITLE: Emission Standards and Procedural Requirements: Asbestos Requirements for Mills, Roadways and Parking lots, and Manufacturing Operations

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Made minor plain language edits.

RULE TEXT:

(1) Emission standard for asbestos mills. No person may cause or allow to be discharged into the atmosphere visible emissions, including fugitive emissions, from any asbestos milling operation except as provided under OAR 340-248-0275(2) Air Cleaning. For purposes of this rule, the presence of uncombined water in the emission plume is not a violation of the visible emission requirement. Outside storage of asbestos materials is not part of an asbestos mill operation. The owner or operator of an asbestos mill must meet the following requirements:

(a) Monitor each potential source of asbestos emissions from a part of the mill facility, including air cleaning devices, process equipment, and buildings that house equipment for material processing and handling, at least once each day, during daylight hours, for visible emissions to the outside air during periods of operations. The monitoring must be by visual observation of at least 15 seconds duration per source of emissions.

(b) Inspect each air cleaning device at least once each week for proper operation and for changes that signal the potential for malfunction including, to the maximum extent possible without dismantling other than opening the device, the presence of tears, holes, and abrasions in filter bags and for dust deposits on the clean side of bags. For air cleaning devices that cannot be inspected on a weekly basis, submit to DEQ, revise as necessary, and implement a written maintenance plan to include, at a minimum, a maintenance schedule and recordkeeping plan.

(c) Maintain records of the results of visible emissions monitoring and air cleaning device inspections using a format approved by DEQ and including the following information:

(A) Date and time of each inspection;

(B) Presence or absence of visible emissions;

(C) Condition of fabric filters, including presence of tears, holes, and abrasions;

(D) Presence of dust deposits on clean side of fabric filters;

(E) Brief description of corrective actions taken, including date and time; and

(F) Daily hours of operation for each air cleaning device.

(d) Furnish upon request, and make available at the affected facility during normal business hours for inspection by DEQ, all records this section requires.

(e) Retain a copy of all monitoring and inspection records for at least two years.

(f) Submit a copy of visible emission monitoring records to DEQ quarterly. The quarterly reports must be postmarked by the 30th day following the end of the calendar quarter.

(g) Asbestos-containing waste material produced by an asbestos milling operation must be disposed of according to OAR 340-248-0280.

(2) Roadways and Parking Lots. No person may construct or maintain, or allow to be constructed or maintained a roadway with asbestos tailings or asbestos-containing waste material on that roadway, unless (for asbestos tailings):

(a) It is a temporary roadway on an area of asbestos ore deposits (asbestos mine);

(b) It is a temporary roadway at an active asbestos mill site and is encapsulated with a resinous or bituminous binder. The encapsulated road surface must be maintained at least once per calendar year or within 12 months of road construction to prevent dust emissions; or

(c) It is encapsulated in asphalt concrete meeting the specifications contained in Section 401 of Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-85, 1985, or their equivalent.

(3) Manufacturing. No person may cause or allow to be discharged into the atmosphere visible emissions, except as provided in OAR 340-248-0275(2), from a building or structure in which manufacturing operations utilizing commercial asbestos are conducted, or directly from such manufacturing operations if they are conducted outside buildings or

structures, or from other fugitive emissions. All asbestos-containing waste material a manufacturing operation produces must be disposed of according to OAR 340-248-0280. Visible emissions from boilers or other points not producing emissions directly from the manufacturing operation and having no possible asbestos material in the exhaust gases are not a violation of this rule. The presence of uncombined water in the exhaust plume is not a violation of the visible emission requirements:

(a) Applicability. Manufacturing operations subject to this rule are as follows:

(A) Manufacturing cloth, cord, wicks, tubing, tape, twine, rope, thread, yarn, roving, lap, or other textile materials;

(B) Manufacturing cement products;

(C) Manufacturing fire proofing and insulating materials;

(D) Manufacturing friction products;

(E) Manufacturing paper, millboard, and felt;

(F) Manufacturing floor tile;

(G) Manufacturing paints, coatings, caulks, adhesives, or sealants;

(H) Manufacturing plastics and rubber materials;

(I) Manufacturing chlorine, using asbestos diaphragm technology;

(J) Manufacturing shotgun shell wads;

(K) Manufacturing asphalt concrete; and

(L) Other manufacturing operation that results or may result in the release of asbestos material to the ambient air.

(b) The owner or operator of the manufacturing operation must monitor each potential source of asbestos emissions from a part of the manufacturing facility, including air cleaning devices, process equipment, and buildings housing material processing and handling equipment. Monitoring must be done at least once each day during daylight hours for visible emissions to the outside air during periods of operation and be by visual observation of at least 15 seconds duration per source of emissions.

(c) The owner or operator of the manufacturing operation must inspect each air cleaning device at least once each week for proper operation and for changes that signal the potential for malfunctions, including, to the maximum extent possible without dismantling other than opening the device, the presence of tears, holes, and abrasions in filter bags and for dust deposits on the clean side of bags. For air cleaning devices that cannot be inspected on a weekly basis, submit to DEQ, revise as necessary, and implement a written maintenance plan to include, at a minimum, a maintenance schedule and recordkeeping plan.

(d) The owner or operator of a manufacturing operation must maintain records of the results of visible emission monitoring and air cleaning device inspections using a format DEQ approves and including the following information:

(A) Date and time of each inspection;

(B) Presence or absence of visible emissions;

(C) Condition of fabric filters, including presence of tears, holes and abrasions;

(D) Presence of dust deposits on clean side of fabric filters;

(E) Brief description of corrective actions taken, including date and time; and

(F) Daily hours of operation for each air cleaning device.

(e) The owner or operator of a manufacturing operation must furnish upon request, and make available at the affected facility during normal business hours for inspection by DEQ, all records this section requires.

(f) The owner or operator of a manufacturing operation must retain a copy of all monitoring and inspection records for at least two years.

(g) The owner or operator of a manufacturing operation must submit quarterly a copy of the visible emission monitoring records to DEQ if visible emissions occurred during the report period. Quarterly reports must be postmarked by the 30th day following the end of the calendar quarter.

(h) Asbestos-containing waste material produced by any asbestos manufacturing operation must be disposed of according to OAR 340-248-0280.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.745

AMEND: 340-248-0220

RULE TITLE: Emission Standards and Procedural Requirements: Reporting Requirements for Asbestos Sources Using Air Cleaning Devices

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Made minor plain language edits and updated OARs rule applies to.

RULE TEXT:
(1) New sources this rule covers must submit the requested information 90 days before initial startup. The reporter must submit changes in the information provided to DEQ within 30 days after the change.
(2) Sources covered by OAR 340-248-0210(1) Mills, 340-248-0210(3) Manufacturing, 340-248-0275(4) Fabricating, and 340-248-0230 Asbestos to Nonasbestos Conversion Operations, must provide the following information to DEQ:
(a) A description of the emission control equipment used for each process;
(b) If a fabric filter device is used to control emissions:
(A) The airflow permeability in m3/min/m2 (ft3/min/ft2) if the fabric filter device uses a woven fabric, and, if the fabric is synthetic, whether the fill yarn is spun or not spun; and
(B) If the fabric filter device uses a felted fabric, the density in g/m2 (oz/yd2), the minimum thickness in millimeters (inches), and the airflow permeability in m3/min/m2 (ft3/min/ft2); and
(c) If a HEPA filter is used to control emissions, the certified efficiency.
(3) Sources covered by this rule and subject to OAR 340-248-0280(1) through 340-248-0280(9) must submit the following information:
(a) A brief description of each process that generates asbestos-containing waste material;
(b) The average volume of asbestos-containing waste material disposed of, measured in m3/day (yd3/day);
(c) The emission control methods used in all stages of waste disposal; and
(d) The type of disposal site or incineration site used for ultimate disposal, the name of the site operator, and the name and location of the disposal site.
(4) Sources this rule covers and subject to OAR 340-248-0280(10) or 340-248-0280(11) must provide the following information:
(a) A brief description of the site; and
(b) The method or methods used to comply with the standards, or alternative procedures used.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.745

AMEND: 340-248-0230

RULE TITLE: Emission Standards and Procedural Requirements: Asbestos to Nonasbestos Conversion Operations

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Updated rule references.

RULE TEXT:

(1) 40 C.F.R. Part 61.155 is by this reference adopted and incorporated herein.

(2) The following substitutions are made in 40 C.F.R. Part 61.155:

(a) "Administrator" means "DEQ";

(b) §61.150 means OAR 340-248-0280;

(c) §61.152 means OAR 340-248-0275(2)(a);

(d) §61.154 means OAR 340-248-0280;

(e) §61.154(e) means OAR 340-248-0280(10)(a); and

(f) §61.154(f) means OAR 340-248-0280(10)(b).

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.745

AMEND: 340-248-0240

RULE TITLE: Emission Standards and Procedural Requirements: Asbestos Inspection Requirements for Oregon Title V Operating Permit Program Sources

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Made minor plain language edits and added renovation activities.

RULE TEXT:

This rule applies to renovation and demolition at major sources subject to the Oregon Title V Operating Permit program as defined in OAR 340-200-0020.

(1) To determine applicability of DEQ's asbestos regulations, the owner or operator of a renovation or demolition activity must thoroughly survey, using an accredited inspector, the affected area for the presence of asbestos, including nonfriable asbestos. A copy of that survey report must remain on site during a demolition or renovation activity.

(2) For demolition or renovation where no asbestos-containing material is present, the facility owner or operator, the owner or operator of a demolition or renovation activity, or the contractor must submit written notification to DEQ on an approved form. The submitter must provide notification as follows:

(a) Submit the notification, as specified in section (3) of this rule, to DEQ at least 10 days before beginning a demolition project.

(b) A notification of demolition is void if the submitter does not notify DEQ before making a change in the scheduled starting or completion date or any other substantive change.

(3) The submitter must provide the following information for each notification of demolition or renovation:

(a) Name, address, and telephone number of the person conducting the demolition or renovation;

(b) Contractor's Oregon demolition license number, if applicable;

(c) Certification that no asbestos was found during the predemolition survey and that if asbestos-containing material is uncovered during demolition the procedures found in OAR 340-248-0250 through 340-248-0280 will be followed;

(d) Description of building, structure, facility, installation, vehicle, or vessel to be demolished, including:

(A) The age and present and prior use of the facility; and

(B) Address or location of the scheduled demolition project;

(e) Major source owner or operator name, address and phone number;

(f) Scheduled starting and completion dates of demolition work; and

(g) Other information requested on DEQ form.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.745

AMEND: 340-248-0250

RULE TITLE: Emission Standards and Procedural Requirements: Exemptions

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Updated exemption requirements.

RULE TEXT:

(1) The following asbestos abatement projects are exemption from certain provisions of this division:

(a) Asbestos abatement conducted inside a single unit private residence is exempt from OAR 340-248-0110 through 340-248-0180, 340-248-0210 through 340-248-0240 and 340-248-0260 through 340-248-0270 if the owner occupies the residence and the owner occupant is performing the asbestos abatement project.

(b) Asbestos abatement the owner conducts outside of a single unit private residence is exempt from the notification requirements contained in OAR 340-248-0260, if the residence is not a rental property, a commercial business, or intended to be demolished.

(c) Demolition and renovation at residential buildings with four or fewer dwelling units, that were constructed after January 1, 2004, are exempt from the provisions of OAR 340-248-0270(1).

(d) Demolition and renovation are exempt from the provisions of OAR 340-248-0270(1) if all of the materials at the affected facility are treated, removed, handled, managed, transported, and disposed of as friable asbestos-containing material as required by this division.

(e) Projects that involve removing mastics and roofing products that are fully encapsulated with a petroleum-based binder and are not hard, dry, or brittle are exempt from OAR 340-248-0110 through 340-248-0280 provided the materials are not made friable.

(f) Projects that involve removing less than three square feet or three linear feet of asbestos-containing material are exempt from OAR 340-248-0110 through 340-248-0180, the notification requirements in 340-248-0260, and the survey requirements in 340-248-0270, provided that removing asbestos is not the primary objective, is part of a needed repair operation, and the methods of removal comply with OAR 437-003-1926.1101 Asbestos, paragraph (g) Methods of Compliance, in Division 3 Construction, Subdivision Z Toxic and Hazardous Substances. Asbestos abatement projects may not be subdivided into smaller sized units in order to qualify for this exemption.

(g) Projects that involve removing asbestos-containing materials that are sealed from the atmosphere by a rigid casing are exempt from OAR 340-248-0110 through 340-248-0275, provided the casing is not broken or otherwise altered such that asbestos fibers could be released during removal, handling, and transport to a permitted disposal site.

(h) Small-scale short duration renovation and maintenance activities are exempt from the requirement to have a certified supervisor present on the asbestos abatement project.

(2) Emergency firefighting is not subject to this division.

(3) Asbestos-containing waste material that is handled and disposed of in compliance with a solid waste permit issued under ORS chapter 459 is not subject to OAR 340-248-0205(1).

(4) Municipal landfills, transfer stations, and material recovery facilities as defined and permitted by OAR 340 division 93 through OAR 340 division 96 that are following DEQ approved operations and special waste management plans are exempt from managing nonfriable asbestos-containing material as OAR 340-248-0280 specifies if the nonfriable asbestos-containing material is first discovered by the permitted disposal site on its tipping floor or within the permitted facility's transfer container, and managing the nonfriable asbestos-containing material as OAR 340-248-0280 requires would present an immediate risk to health and safety. A disposal site that manages its waste under this subpart must immediately notify the final permitted disposal site, as applicable, and notify DEQ within 24 hours of discovering nonfriable asbestos containing material on its tipping floor or in its transfer container.

(5) A person performing vehicle brake and clutch maintenance or repair is exempt from OAR 340-248-0100 through OAR 340-248-0180.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.745

AMEND: 340-248-0260

RULE TITLE: Emission Standards and Procedural Requirements: Asbestos Abatement Notification Requirements

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Updated notification requirements and made minor plain language edits.

RULE TEXT:

(1) Except as provided under OAR 340-248-0250, written notification of an asbestos abatement project must be submitted to DEQ on a DEQ-approved form, accompanied by the appropriate fee. The notification must be submitted by the facility owner or operator, the owner or operator of a demolition or renovation activity, or by the contractor as required by sections (2) through (5) of this rule, except as provided in sections (6), (7), and (8). A notification revision must be submitted by the facility owner or operator, the owner or operator of a demolition or renovation activity, or the contractor in accordance with section (10) of this rule.

(2) DEQ must receive notifications as specified in section (5) of this rule and the project notification fee at least 10 days before beginning a friable asbestos abatement project and at least five days before beginning a nonfriable asbestos abatement project.

(a) The project notification fee is:

(A) $100 for each project that will abate less than 40 linear feet or 80 square feet of asbestos-containing material, is at a residential building, or is a nonfriable asbestos abatement project not subject to paragraph (K).

(B) $200 for each project that will abate more than or equal to 40 linear feet or 80 square feet but less than 260 linear feet or 160 square feet of asbestos-containing material.

(C) $400 for each project that will abate more than or equal to 260 linear feet or 160 square feet, and less than 1300 linear feet or 800 square feet of asbestos-containing material.

(D) $525 for each project that will abate more than or equal to 1300 linear feet or 800 square feet, and less than 2600 linear feet or 1600 square feet of asbestos-containing material.

(E) $900 for each project that will abate more than or equal to 2600 linear feet or 1600 square feet, and less than 5000 linear feet or 3500 square feet of asbestos-containing material.

(F) $1,050 for each project that will abate more than or equal to 5000 linear feet or 3500 square feet, and less than 10,000 linear feet or 6000 square feet of asbestos-containing material.

(G) $1,700 for each project that will abate more than or equal to 10,000 linear feet or 6000 square feet, and less than 26,000 linear feet or 16,000 square feet of asbestos-containing material.

(H) $2,800 for each project that will abate more than or equal to 26,000 linear feet or 16,000 square feet, and less than 260,000 linear feet or 160,000 square feet of asbestos-containing material.

(I) $3,500 for each project that will abate more than 260,000 linear feet or 160,000 square feet of asbestos-containing material.

(J) $750 for annual notifications for friable asbestos abatement projects that will abate 40 linear feet or 80 square feet or less of asbestos-containing material.

(K) $500 for annual notifications for nonfriable asbestos abatement projects performed at schools, colleges, and facilities.

(b) Project notification fees must accompany the project notification form. Notification has not occurred until DEQ receives the completed notification form and appropriate fee.

(c) DEQ may waive the 10-day and the five-day notification requirement in section (2) of this rule in emergencies that directly affect human life, health, and property. This includes:

(A) Emergencies where there is an imminent threat of loss of life or severe injury;

(B) Emergencies where the public is potentially exposed to air-borne asbestos fibers; and

(C) Emergencies where significant property damage will occur if repairs are not made immediately.

(d) DEQ may waive the 10-day and the five-day notification requirement in section (2) of this rule for asbestos abatement projects that were not planned, resulted from unexpected events, and will cause damage to equipment or

impose unreasonable financial burden if not performed immediately. This includes the non-routine failure of equipment.
(e) In either subsection (c) or (d) of this section persons responsible for such asbestos abatement projects must submit an emergency or unexpected event abatement request to DEQ before starting work or by 9:00 am of the next working day if the work was performed on a weekend, evening, or holiday. The request must include a copy of the completed and appropriate notification form. Notification as specified in section (5) of this rule and the appropriate fee must be submitted to DEQ within three days of starting emergency or unexpected event asbestos abatement projects.
(f) The duration of an asbestos abatement notification may not exceed one year beyond the original starting date. The project starting and completion date provided in a notification for an asbestos abatement project must be commensurate with the amount of asbestos-containing material involved. If a project exceeds one year in duration, a new notification must be provided as described in this rule, including payment of a new notification fee.
(3) The facility owner or operator, the owner or operator of a demolition or renovation activity, or the contractor may submit annual notification for friable asbestos abatement projects where no more than 40 linear or 80 square feet of asbestos-containing material is removed at each project. Friable asbestos abatement projects subject to an annual notification may be conducted at multiple facilities by a single licensed asbestos contractor, or at a facility that has a centrally controlled asbestos operation and maintenance program where the facility owner uses appropriately trained and certified personnel to remove asbestos. The contractor owner or operator must submit the notification as follows:
(a) Establish eligibility for use of this notification procedure with DEQ prior to use.
(b) The notification must contain the information specified in subsections (5)(a) through (5)(i) of this rule to the extent possible.
(c) Provide to DEQ on a DEQ form a summary report of all asbestos abatement projects conducted in the previous three months by the 15th day of the month following the end of the calendar quarter. The summary report must include the information specified in subsections (5)(i) through (5)(l) of this rule for each project.
(d) Provide to DEQ, upon request, a list of asbestos abatement projects that are scheduled or are being conducted at the time of the request.
(e) Submit project notification and fee prior to use of this notification procedure.
(f) Failure to provide payment for use of this notification procedure will void the notification and each subsequent abatement project will be individually assessed a project notification fee.
(4) Annual nonfriable asbestos abatement projects may only be performed at schools, colleges, and facilities where certified asbestos abatement workers perform the removal work. Submit the notification as follows:
(a) Establish eligibility for use of this notification procedure with DEQ prior to use.
(b) The notification must contain the information specified in subsections (5)(a) through (5)(i) of this rule to the extent possible.
(c) Provide to DEQ on a DEQ form, a summary report of all nonfriable asbestos abatement projects conducted in the previous three months by the 15th day of the month following the end of the calendar quarter. The summary report must include the information specified in subsections (5)(i) through (5)(l) of this rule for each project.
(d) Submit project notification and fee before using this notification procedure.
(e) Failure to provide payment for use of this notification procedure will void the notification and DEQ will individually asses each subsequent nonfriable abatement project a project notification fee.
(f) Provide to DEQ, upon request, a list of nonfriable asbestos abatement projects that are scheduled or are being conducted at the time of the request.
(5) The following information must be provided for each notification:
(a) Name, phone number, and address of person conducting asbestos abatement project.
(b) The Oregon asbestos abatement contractor's license number and certification number of the supervisor for the asbestos abatement project or, for nonfriable asbestos abatement projects, the name of the supervising person that meets Oregon OSHA's competent person qualifications as required in 29 C.F.R. 1926.1101(b) , adopted by reference under OAR 437-003-0001(25).
(c) Method of asbestos abatement to be employed.

(d) Procedures to be employed to insure compliance with OAR 340-248-0270 through 340-248-0280.
(e) Names, addresses, and phone numbers of waste transporters.
(f) Name and address or location of the permitted disposal site where the asbestos-containing waste material will be deposited.
(g) Description of asbestos disposal procedure.
(h) Description of building, structure, facility, installation, vehicle, equipment, or vessel to be demolished or renovated, including:
(A) The construction or manufacture date, and the present and prior use of the facility; and
(B) Address or location where the asbestos abatement project is to be accomplished, including building, floor, and room numbers.
(i) Full name, address, and phone number of the owner or operator of a demolition or renovation activity.
(j) Starting and completion dates of asbestos abatement work.
(k) Description of the asbestos-containing material, type of asbestos, percent asbestos, and location of the asbestos-containing material.
(l) Amount of asbestos-containing material to be abated: linear feet or square feet.
(m) For facilities described in OAR 340-248-0270(8)(f) provide the name, title and authority of the State or local government official who ordered the demolition, date the order was issued, and the date demolition is to begin.
(n) Other information requested on the DEQ form.
(6) The project notification fees specified in this section will be increased by 50% when an asbestos abatement project is commenced without filing a project notification, submittal of a notification fee, or when notification is provided less than 10 days or five days prior to commencement of work, as applicable, under subsections (2)(c) and (d) of this rule.
(7) DEQ may waive part or all of a notification fee, on a case-by-case basis, based upon financial hardship. Requests for waiver of fees must be made in writing to DEQ. Applicants for waivers must describe the reason for the request and certify financial hardship.
(8) Subject to OAR 340-200-0010(3), a regional authority may adopt project notification fees for asbestos abatement projects in different amounts than are set forth in this rule. The regional authority will base the fees on its costs in carrying out the delegated asbestos program. The regional authority may collect, retain, and expend such project notification fees for asbestos abatement projects within its jurisdiction.
(9) Notification fee refunds. DEQ will consider a refunding a notification fee only as this section provides. A request for a refund of fees must be made in writing to DEQ, and must be submitted prior to the project's original start date. DEQ will not consider a refund request that does not include all required information described in this section. If DEQ receives a complete request for refund under this section, then DEQ may refund the notification fee the requestor paid if it determines that a refund is warranted based on the reason the refund is requested. Requests for refunds must include the following written information and documentation:
(a) A description of the reason that a refund is requested;
(b) A copy of the original notification and the most recent revision;
(c) Proof that the requester was awarded the contract for the project prior to submitting the notification to DEQ;
(d) Verification of payment to DEQ; and
(e) Proof that asbestos-containing material or asbestos-containing waste material was present at the project site, such as laboratory results, or when material was assumed to be asbestos-containing and treated as such in order to avoid survey and laboratory costs, a depiction of the material.
(10) DEQ must receive notification revisions before changes are made to the start date or completion date of the project or immediately upon discovery that other changes to the project notification form are necessary. A notification of a revision under this section must indicate that it is a revised notification.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468.020, 468A.025

AMEND: 340-248-0270

RULE TITLE: Emission Standards and Procedural Requirements: Asbestos Work Practices and Procedures

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Updated residential survey requirements, work practices, and made minor plain language edits.

RULE TEXT:

(1) Except as OAR 340-248-0250 provides, before performing a demolition or renovation, the owner or operator of a demolition or renovation activity must have an accredited inspector complete a survey according to OAR 340-248-0270(3).

(2) The owner or operator of a demolition or renovation activity that requires a survey under OAR 340-248-0270(1) must send a copy of the asbestos survey report to DEQ upon request by DEQ and keep a copy of the asbestos survey report onsite at the facility during a demolition or renovation activity.

(3) The asbestos survey required by OAR 340-248-0270(1) must include all of the following:

(a) Collecting samples of all materials suspected of being asbestos-containing materials, unless the material is presumed to be asbestos-containing material, including at least one bulk sample for each homogeneous material suspected of being asbestos-containing material;

(b) For sprayed or troweled on surfacing materials, collection of at least three (3) random bulk samples for each homogeneous area;

(c) Beginning January 1, 2021, each sample collected under subsections (a) and (b) must be analyzed to determine whether it is asbestos-containing material by a laboratory with proficiency demonstrated by participation in a nationally recognized laboratory accreditation program for asbestos testing, or participate in, and maintain passing status in a nationally recognized bulk asbestos proficiency testing program;

(d) An asbestos survey report that contains the following:

(A) The date or dates that the survey was performed;

(B) The phone number and a copy of the certificate of each accredited inspector that performed a survey;

(C) Site address and location where the survey was performed;

(D) Name and phone number of the owner or operator of the facility where the survey was performed and the owner or operator of the demolition or renovation activity if different;

(E) Description of the facility and area surveyed, including its past and current use, area square footage, approximate construction date, and number of floors;

(F) The purpose of the survey, for example, whether it is for a project involving pre-demolition, renovation, removal of asbestos-containing material due to damage from fire, water, or other purpose;

(G) Detailed description of limitations on the thoroughness of the survey, for example an inaccessible area; and

(H) A table listing all of the homogeneous materials sampled and identified as asbestos-containing material and all of the presumed asbestos-containing materials. The table must include the following for each material:

(i) The percent asbestos and type of asbestiform, as determined by the laboratory that analyzes the sample;

(ii) A description of the material color, texture, and pattern;

(iii) The location of where in the facility the material was collected;

(iv) A description of the material condition as in good condition or in poor condition;

(v) The identification of the material as friable or nonfriable; and

(vi) The approximate quantity of the material at the facility.

(I) A recommendation of response actions that comply with the requirements of this division; and

(J) A complete copy of the laboratory report for all samples taken and analyzed under subjections (a) – (c) of this section. The minimum requirements for the laboratory report include:

(i) Laboratory name, address, and phone number;

(ii) Unique sample analysis identification number;

(iii) Bulk sample analysis results showing asbestos content;

(iv) Name of the analyst; and
(v) Completed chain of custody for the samples.
(4) For a demolition or renovation of a residential building, DEQ may approve, on a case-by-case basis, a request to waive the survey requirement of OAR 340-248-0270(1). The owner or operator of the residential building must submit a written request to DEQ, along with supporting documentation that demonstrates to DEQ's satisfaction that a survey is not warranted. The owner or operator of the residential building must obtain DEQ's written approval waiving the survey requirement prior to a demolition or renovation. The owner or operator of the residential building must maintain as readily available at the demolition or renovation site a copy of DEQ's written approval under this rule.
(5) Upon discovering asbestos-containing materials or asbestos-containing waste materials found during demolition, renovation, or after an emergency or unexpected event including an event that causes fire, water, earthquake, or wind damage, the owner or operator of the demolition or renovation activity or the owner or operator performing the emergency response must:
(a) Stop work immediately;
(b) Keep the exposed asbestos-containing materials and asbestos-containing waste material, adequately wet and cover with 6 mil plastic or equivalent at all times until a licensed asbestos abatement contractor begins removal activities in compliance with this division; and
(c) Have the licensed asbestos abatement contractor remove, handle and dispose of all friable asbestos-containing waste material and asbestos-containing waste material as friable asbestos-containing material.
(6) A person who removes nonfriable asbestos-containing material not exempted under OAR 340-248-0250(1) must comply with the following:
(a) Submit asbestos removal notification and the appropriate fee to the DEQ Business Office on a DEQ form in accordance with OAR 340-248-0260.
(b) Remove nonfriable asbestos materials in a manner that ensures the material remains nonfriable.
(c) A nonfriable asbestos abatement project is exempt from the asbestos licensing and certification requirements under OAR 340-248-0100 through 340-248-0180. The exemption ends whenever the asbestos-containing material becomes friable.
(7) Before a facility is demolished by intentional burning, all asbestos-containing material must be removed and disposed of in accordance with OAR 340-248-0010 through 340-248-0280.
(8) Except as OAR 340-248-0250 provides, a person performing an asbestos abatement project must employ the following procedures:
(a) Conduct the asbestos abatement project inside a regulated area.
(b) Remove all asbestos-containing materials as part of the asbestos abatement project before another demolition or renovation activity begins that would break up, dislodge, or disturb the materials or preclude access to the materials for subsequent removal. Asbestos-containing materials need not be removed if:
(A) They are on a facility component that is encased in concrete or other similar material and are adequately wetted whenever exposed during demolition or renovation; or
(B) They were not discovered before demolition or renovation and cannot be removed because of unsafe conditions the demolition or renovation caused.
(c) Adequately wet asbestos-containing materials when they are being removed. In renovation, maintenance, repair, and construction operations, where wetting would unavoidably damage equipment, is incompatible with specialized work practices or presents a safety hazard, adequate wetting is not required if the person performing the asbestos abatement project:
(A) Obtains prior written approval from DEQ for dry removal of asbestos-containing material;
(B) Keep a copy of DEQ's written approval available for inspection at the work site;
(C) Adequately wraps or encloses asbestos-containing material during handling to avoid releasing fibers; and
(D) Uses a local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the asbestos abatement project.

(d) When a facility component covered or coated with asbestos-containing materials is being taken out of the facility as units or in sections, the person performing the asbestos abatement project:
(A) Must adequately wet an asbestos-containing materials exposed during cutting or disjointing operation;
(B) Must carefully lower the units or sections to ground level, not dropping them or throwing them; and
(C) May leave asbestos-containing materials in large facility components such as reactor vessels, large tanks and steam generators, but excluding beams, if the following requirements are met:
(i) The component is removed, transported, stored, disposed of, or reused without disturbing or damaging the asbestos-containing material;
(ii) The component is encased in leak-tight wrapping; and
(iii) The leak-tight wrapping is labeled according to OAR 340-248-0280(2)(b) during all loading and unloading operations and during storage.
(e) For friable asbestos materials being abated:
(A) Adequately wet the materials to ensure that they remain wet until they are disposed of in accordance with OAR 340-248-0280;
(B) Carefully lower the materials to the floor, not dropping or throwing them;
(C) With DEQ's prior written approval, transport the materials to the ground via dust-tight chutes or containers if they have been removed or stripped above ground level and were not removed as units or in sections;
(D) Enclose the area where friable asbestos materials are to be abated with a negative pressure enclosure prior to and during abatement unless DEQ grants written approval for an alternative;
(E) Install a minimum of one viewing window in all enclosures, including negative pressure enclosures, in accordance with the following:
(i) Each viewing window must be a minimum of two feet by two feet and be made of a material that will allow a clear view inside the enclosure; and
(ii) For large enclosures, including negative pressure enclosures, install one viewing window for every 5,000 square feet of area when spatially feasible; and
(F) A negative pressure enclosure is not required for abatement of friable asbestos-containing material when:
(i) Abating asbestos-containing petroleum-based roofing products or cement asbestos roofing; or
(ii) Abating a total project amount of asbestos-containing material that may be contained in a single glove bag.
(f) A person who demolishes a facility under an order of the State of Oregon or a local governmental agency, issued because the facility is structurally unsound and in danger of imminent collapse must comply with the following:
(A) Obtain DEQ's written approval for an ordered demolition procedure before that demolition takes place;
(B) Send a copy of the order and an asbestos abatement project notification (as described in OAR 340-248-0260) to DEQ before starting demolition work;
(C) Keep a copy of the order, DEQ's approval, and the notification form at the demolition site during all phases of demolition until final disposal of the project waste at a permitted disposal site; and
(D) Keep asbestos-containing materials and asbestos-containing waste materials adequately wet during demolition and comply with the disposal requirements set forth in OAR 340-248-0280.
(g) A person performing asbestos abatement may not use mechanical equipment to remove asbestos containing material outside of a full negative pressure enclosure without prior written approval from DEQ.
(h) Visible emissions are not allowed during an asbestos abatement activity, except within a negative air pressure enclosure.
(i) An exhaust ventilation and collection system, negative air machine, or vacuuming equipment used during an asbestos abatement project must be equipped with a HEPA filter or other filter of equal or greater collection efficiency and must be sealed with a 6 mil plastic or equivalent when not in use.
(j) DEQ may approve, on a case-by-case basis, requests to use an alternative to the requirements contained in this rule. The person performing the asbestos abatement project must submit a written description of the proposed alternative and demonstrate to DEQ's satisfaction that the proposed alternative provides public health protection equivalent to

the protection that would be provided by the specific requirement, or that such level of protection cannot be obtained for the asbestos abatement project.
(k) Final Air Clearance Sampling Requirements apply to projects involving more than 160 square feet or 260 linear feet of asbestos-containing material. Before the negative pressure enclosure around such an area is removed, the person performing the abatement must have at least one air sample collected. All samples collected that document that the air inside the negative pressure enclosure has no more than 0.01 fibers per cubic centimeter of air. DEQ may grant a waiver to this section or exceptions to the following requirements upon receiving an advanced written request:
(A) The air clearance samples must be collected and analyzed by a party who is National Institute of Occupational Safety and Health (NIOSH) 582 certified and financially independent from the person performing the asbestos abatement project, other than receiving compensation for undertaking the specific sampling and analysis required in this paragraph;
(B) Before final air clearance sampling is performed the following must be completed:
(i) All visible asbestos-containing material and asbestos-containing waste material must be removed and properly packaged and stored according to the requirements of this division;
(ii) The air and surfaces within the negative pressure enclosure must be sprayed with an encapsulant prior to air clearance sampling;
(iii) Air sampling may start when the encapsulant has settled sufficiently so that the filter of the sample is not clogged by airborne encapsulant; and
(iv) Air filtration units must remain on during the air-monitoring period;
(C) Air clearance sampling inside negative pressure enclosure areas must be aggressive and comply with the following procedures:
(i) Immediately before starting the sampling pumps, direct exhaust from a minimum one horse power forced air blower against all walls, ceilings, floors, ledges, and other surfaces in the negative pressure enclosure;
(ii) Then place stationary fans in locations that will not interfere with air monitoring equipment and direct the fans toward the ceiling. Use one fan per 10,000 cubic feet of room space;
(iii) Start sampling pumps and sample an adequate volume of air to detect concentrations of 0.01 fibers of asbestos per cubic centimeter according to NIOSH 7400 method;
(iv) When sampling is completed turn off the pump and then the fan(s); and
(v) As an alternative the air clearance sample analysis may be performed according to Transmission Electron Microscopy Analytical Methods prescribed by 40 C.F.R. 763, Appendix A to Subpart E (Interim Transmission Electron Microscopy Analytical Methods); and
(D) The person performing an asbestos abatement project must submit the final air clearance sample results to DEQ on a DEQ form and include all third-party air clearance analysis reports. The clearance results must be received by DEQ within 30 days after the completion date of the asbestos abatement project.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468A.745

ASBESTOS and OTHER FIBERS by PCM 7400

FORMULA: Various MW: Various CAS: see Synonyms RTECS: Various

METHOD: 7400, Issue 2 **EVALUATION: FULL** **Issue 1: Rev. 3 on 15 May 1989**
Issue 2: 15 August 1994

OSHA: 0.1 asbestos fiber (> 5 µm long)/cc; 1 f/cc, 30 min excursion; carcinogen
MSHA: 2 asbestos fibers/cc
NIOSH: 0.1 f/cc (fibers > 5 µm long), 400 L; carcinogen
ACGIH: 0.2 f/cc crocidolite; 0.5 f/cc amosite; 2 f/cc chrysotile and other asbestos; carcinogen

PROPERTIES: solid, fibrous, crystalline, anisotropic

SYNONYMS [CAS #]: actinolite [77536-66-4] or ferroactinolite [15669-07-5]; amosite [12172-73-5]; anthophyllite [77536-67-5]; chrysotile [12001-29-5]; serpentine [18786-24-8]; crocidolite [12001-28-4]; tremolite [77536-68-6]; amphibole asbestos [1332-21-4]; refractory ceramic fibers [142844-00-6]; fibrous glass

SAMPLING

SAMPLER: FILTER (0.45- to 1.2-µm cellulose ester membrane, 25-mm; conductive cowl on cassette)

FLOW RATE*: 0.5 to 16 L/min

VOL-MIN*: 400 L @ 0.1 fiber/cc
-MAX*: (step 4, sampling)

*Adjust to give 100 to 1300 fiber/mm^2

SHIPMENT: routine (pack to reduce shock)

SAMPLE STABILITY: stable

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIED: 80 to 100 fibers counted

BIAS: see EVALUATION OF METHOD

OVERALL PRECISION ($\hat{S}_{rT}$): 0.115 to 0.13 [1]

ACCURACY: see EVALUATION OF METHOD

MEASUREMENT

TECHNIQUE: LIGHT MICROSCOPY, PHASE CONTRAST

ANALYTE: fibers (manual count)

SAMPLE PREPARATION: acetone - collapse/triacetin - immersion method [2]

COUNTING RULES: described in previous version of this method as "A" rules [1,3]

EQUIPMENT:
1. positive phase-contrast microscope
2. Walton-Beckett graticule (100-µm field of view) Type G-22
3. phase-shift test slide (HSE/NPL)

CALIBRATION: HSE/NPL test slide

RANGE: 100 to 1300 fibers/mm^2 filter area

ESTIMATED LOD: 7 fibers/mm^2 filter area

PRECISION ($\bar{S}_r$): 0.10 to 0.12 [1]; see EVALUATION OF METHOD

APPLICABILITY: The quantitative working range is 0.04 to 0.5 fiber/cc for a 1000-L air sample. The LOD depends on sample volume and quantity of interfering dust, and is <0.01 fiber/cc for atmospheres free of interferences. The method gives an index of airborne fibers. It is primarily used for estimating asbestos concentrations, though PCM does not differentiate between asbestos and other fibers. Use this method in conjunction with electron microscopy (e.g., Method 7402) for assistance in identification of fibers. Fibers < ca. 0.25 µm diameter will not be detected by this method [4]. This method may be used for other materials such as fibrous glass by using alternate counting rules (see Appendix C).

INTERFERENCES: If the method is used to detect a specific type of fiber, any other airborne fiber may interfere since all particles meeting the counting criteria are counted. Chain-like particles may appear fibrous. High levels of non-fibrous dust particles may obscure fibers in the field of view and increase the detection limit.

OTHER METHODS: This revision replaces Method 7400, Revision #3 (dated 5/15/89).

REAGENTS:

1. Acetone,* reagent grade.
2. Triacetin (glycerol triacetate), reagent grade.

*See SPECIAL PRECAUTIONS.

EQUIPMENT:

1. Sampler: field monitor, 25-mm, three-piece cassette with ca. 50-mm electrically conductive extension cowl and cellulose ester filter, 0.45- to 1.2-µm pore size, and backup pad.
   NOTE 1: Analyze representative filters for fiber background before use to check for clarity and background. Discard the filter lot if mean is ≥ 5 fibers per 100 graticule fields. These are defined as laboratory blanks. Manufacturer-provided quality assurance checks on filter blanks are normally adequate as long as field blanks are analyzed as described below.
   NOTE 2: The electrically conductive extension cowl reduces electrostatic effects. Ground the cowl when possible during sampling.
   NOTE 3: Use 0.8-µm pore size filters for personal sampling. The 0.45-µm filters are recommended for sampling when performing TEM analysis on the same samples. However, their higher pressure drop precludes their use with personal sampling pumps.
   NOTE 4: Other cassettes have been proposed that exhibit improved uniformity of fiber deposit on the filter surface, e.g., bellmouthed sampler (Envirometrics, Charleston, SC). These may be used if shown to give measured concentrations equivalent to sampler indicated above for the application.
2. Personal sampling pump, battery or line-powered vacuum, of sufficient capacity to meet flow-rate requirements (see step 4 for flow rate), with flexible connecting tubing.
3. Wire, multi-stranded, 22-gauge; 1″ hose clamp to attach wire to cassette.
4. Tape, shrink- or adhesive-.
5. Slides, glass, frosted-end, pre-cleaned, 25- × 75-mm.
6. Cover slips, 22- × 22-mm, No. 1½, unless otherwise specified by microscope manufacturer.
7. Lacquer or nail polish.
8. Knife, #10 surgical steel, curved blade.
9. Tweezers.

EQUIPMENT (continued):

10. Acetone flash vaporization system for clearing filters on glass slides (see ref. [5] for specifications or see manufacturer's instructions for equivalent devices).
11. Micropipets or syringes, 5-µL and 100- to 500-µL.
12. Microscope, positive phase (dark) contrast, with green or blue filter, adjustable field iris, 8 to 10× eyepiece, and 40 to 45× phase objective (total magnification ca. 400×); numerical aperture = 0.65 to 0.75.
13. Graticule, Walton-Beckett type with 100-µm diameter circular field (area = 0.00785 mm^2) at the specimen plane (Type G-22). Available from Optometrics USA, P.O. Box 699, Ayer, MA 01432 [phone (508)-772-1700], and McCrone Accessories and Components, 850 Pasquinelli Drive, Westmont, IL 60559 [phone (312) 887-7100].
    NOTE: The graticule is custom-made for each microscope. (see APPENDIX A for the custom-ordering procedure).
14. HSE/NPL phase contrast test slide, Mark II. Available from Optometrics USA (address above).
15. Telescope, ocular phase-ring centering.
16. Stage micrometer (0.01-mm divisions).

SPECIAL PRECAUTIONS: Acetone is extremely flammable. Take precautions not to ignite it. Heating of acetone in volumes greater than 1 mL must be done in a ventilated laboratory fume hood using a flameless, spark-free heat source.

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. To reduce contamination and to hold the cassette tightly together, seal the crease between the cassette base and the cowl with a shrink band or light colored adhesive tape. For personal sampling, fasten the (uncapped) open-face cassette to the worker's lapel. The open face should be oriented downward.
    NOTE: The cowl should be electrically grounded during area sampling, especially under conditions of low relative humidity. Use a hose clamp to secure one end of the wire (Equipment, Item 3) to the monitor's cowl. Connect the other end to an earth ground (i.e., cold water pipe).
3. Submit at least two field blanks (or 10% of the total samples, whichever is greater) for each set of samples. Handle field blanks in a manner representative of actual handling of associated samples in the set. Open field blank cassettes at the same time as other cassettes just prior to sampling. Store top covers and cassettes in a clean area (e.g., a closed bag or box) with the top covers from the sampling cassettes during the sampling period.
4. Sample at 0.5 L/min or greater [6]. Adjust sampling flow rate, Q (L/min), and time, t (min), to produce a fiber density, E, of 100 to 1300 fibers/mm^2 (3.85×10^4 to 5×10^5 fibers per 25-mm filter with effective

collection area A_c = 385 mm^2) for optimum accuracy. These variables are related to the action level (one-half the current standard), L (fibers/cc), of the fibrous aerosol being sampled by:

$$t = \frac{A_c \times E}{Q \times L \times 10^3}.$$

NOTE 1: The purpose of adjusting sampling times is to obtain optimum fiber loading on the filter. The collection efficiency does not appear to be a function of flow rate in the range of 0.5 to 16 L/min for asbestos fibers [7]. Relatively large diameter fibers (>3 µm) may exhibit significant aspiration loss and inlet deposition. A sampling rate of 1 to 4 L/min for 8 h is appropriate in atmospheres containing ca. 0.1 fiber/cc in the absence of significant amounts of non-asbestos dust. Dusty atmospheres require smaller sample volumes (≤400 L) to obtain countable samples. In such cases take short, consecutive samples and average the results over the total collection time. For documenting episodic exposures, use high flow rates (7 to 16 L/min) over shorter sampling times. In relatively clean atmospheres, where targeted fiber concentrations are much less than 0.1 fiber/cc, use larger sample volumes (3000 to 10000 L) to achieve quantifiable loadings. Take care, however, not to overload the filter with background dust. If ≥50% of the filter surface is covered with particles, the filter may be too overloaded to count and will bias the measured fiber concentration.

NOTE 2: OSHA regulations specify a minimum sampling volume of 48 L for an excursion measurement, and a maximum sampling rate of 2.5 L/min [3].

5. At the end of sampling, replace top cover and end plugs.
6. Ship samples with conductive cowl attached in a rigid container with packing material to prevent jostling or damage.
   NOTE: Do not use untreated polystyrene foam in shipping container because electrostatic forces may cause fiber loss from sample filter.

SAMPLE PREPARATION:

NOTE 1: The object is to produce samples with a smooth (non-grainy) background in a medium with refractive index ≤ 1.46. This method collapses the filter for easier focusing and produces permanent (1–10 years) mounts which are useful for quality control and interlaboratory comparison. The aluminum "hot block" or similar flash vaporization techniques may be used outside the laboratory [2]. Other mounting techniques meeting the above criteria may also be used (e.g., the laboratory fume hood procedure for generating acetone vapor as described in Method 7400—revision of 5/15/85, or the non-permanent field mounting technique used in P&CAM 239 [3,7–9]). Unless the effective filtration area is known, determine the area and record the information referenced against the sample ID number [1,9–11].

NOTE 2: Excessive water in the acetone may slow the clearing of the filter, causing material to be washed off the surface of the filter. Also, filters that have been exposed to high humidities prior to clearing may have a grainy background.

7. Ensure that the glass slides and cover slips are free of dust and fibers.
8. Adjust the rheostat to heat the "hot block" to ca. 70 °C [2].
   NOTE: If the "hot block" is not used in a fume hood, it must rest on a ceramic plate and be isolated from any surface susceptible to heat damage.
9. Mount a wedge cut from the sample filter on a clean glass slide.
   a. Cut wedges of ca. 25% of the filter area with a curved-blade surgical steel knife using a rocking motion to prevent tearing. Place wedge, dust side up, on slide.
      NOTE: Static electricity will usually keep the wedge on the slide.
   b. Insert slide with wedge into the receiving slot at base of "hot block". Immediately place tip of a micropipet containing ca. 250 µL acetone (use the minimum volume needed to consistently clear the filter sections) into the inlet port of the PTFE cap on top of the "hot block" and inject the

acetone into the vaporization chamber with a slow, steady pressure on the plunger button while holding pipet firmly in place. After waiting 3 to 5 s for the filter to clear, remove pipet and slide from their ports.

CAUTION: Although the volume of acetone used is small, use safety precautions. Work in a well-ventilated area (e.g., laboratory fume hood). Take care not to ignite the acetone. Continuous use of this device in an unventilated space may produce explosive acetone vapor concentrations.

c. Using the 5-µL micropipet, immediately place 3.0 to 3.5 µL triacetin on the wedge. Gently lower a clean cover slip onto the wedge at a slight angle to reduce bubble formation. Avoid excess pressure and movement of the cover glass.

NOTE: If too many bubbles form or the amount of triacetin is insufficient, the cover slip may become detached within a few hours. If excessive triacetin remains at the edge of the filter under the cover slip, fiber migration may occur.

d. Mark the outline of the filter segment with a glass marking pen to aid in microscopic evaluation.

e. Glue the edges of the cover slip to the slide using lacquer or nail polish [12]. Counting may proceed immediately after clearing and mounting are completed.

NOTE: If clearing is slow, warm the slide on a hotplate (surface temperature 50 °C) for up to 15 min to hasten clearing. Heat carefully to prevent gas bubble formation.

CALIBRATION AND QUALITY CONTROL:

10. Microscope adjustments. Follow the manufacturer's instructions. At least once daily use the telescope ocular (or Bertrand lens, for some microscopes) supplied by the manufacturer to ensure that the phase rings (annular diaphragm and phase-shifting elements) are concentric. With each microscope, keep a logbook in which to record the dates of microscope cleanings and major servicing.

    a. Each time a sample is examined, do the following:

        (1) Adjust the light source for even illumination across the field of view at the condenser iris. Use Kohler illumination, if available. With some microscopes, the illumination may have to be set up with bright field optics rather than phase contract optics.

        (2) Focus on the particulate material to be examined.

        (3) Make sure that the field iris is in focus, centered on the sample, and open only enough to fully illuminate the field of view.

    b. Check the phase-shift detection limit of the microscope periodically for each analyst/microscope combination:

        (1) Center the HSE/NPL phase-contrast test slide under the phase objective.

        (2) Bring the blocks of grooved lines into focus in the graticule area.

        NOTE: The slide contains seven blocks of grooves (ca. 20 grooves per block) in descending order of visibility. For asbestos counting, the microscope optics must completely resolve the grooved lines in block 3 although they may appear somewhat faint, and the grooved lines in blocks 6 and 7 must be invisible when centered in the graticule area. Blocks 4 and 5 must be at least partially visible but may vary slightly in visibility between microscopes. A microscope which fails to meet these requirements has resolution either too low or too high for fiber counting.

        (3) If image quality deteriorates, clean the microscope optics. If the problem persists, consult the microscope manufacturer.

11. Document the laboratory's precision for each counter for replicate fiber counts.

    a. Maintain as part of the laboratory quality assurance program a set of reference slides to be used on a daily basis [13]. These slides should consist of filter preparations including a range of loadings and background dust levels from a variety of sources including both field and reference samples (e.g., PAT, AAR, commercial samples). The Quality Assurance Officer should maintain custody of the reference slides and should supply each counter with a minimum of one reference

slide per workday. Change the labels on the reference slides periodically so that the counter does not become familiar with the samples.

b. From blind repeat counts on reference slides, estimate the laboratory intra- and intercounter precision. Obtain separate values of relative standard deviation (S_r) for each sample matrix analyzed in each of the following ranges: 5 to 20 fibers in 100 graticule fields, >20 to 50 fibers in 100 graticule fields, and >50 to 100 fibers in 100 graticule fields. Maintain control charts for each of these data files.

NOTE: Certain sample matrices (e.g., asbestos cement) have been shown to give poor precision [9].

12. Prepare and count field blanks along with the field samples. Report counts on each field blank.

NOTE 1: The identity of blank filters should be unknown to the counter until all counts have been completed.

NOTE 2: If a field blank yields greater than 7 fibers per 100 graticule fields, report possible contamination of the samples.

13. Perform blind recounts by the same counter on 10% of filters counted (slides relabeled by a person other than the counter). Use the following test to determine whether a pair of counts by the same counter on the same filter should be rejected because of possible bias: Discard the sample if the absolute value of the difference between the square roots of the two counts (in fiber/mm^2) exceeds $2.77XS_r'$ where X = average of the square roots of the two fiber counts (in fiber/mm^2) and $S_r' = S_r / 2$ where S_r is the intracounter relative standard deviation for the appropriate count range (in fibers) determined in step 11. For more complete discussions see reference [13].

NOTE 1: Since fiber counting is the measurement of randomly placed fibers which may be described by a Poisson distribution, a square root transformation of the fiber count data will result in approximately normally distributed data [13].

NOTE 2: If a pair of counts is rejected by this test, recount the remaining samples in the set and test the new counts against the first counts. Discard all rejected paired counts. It is not necessary to use this statistic on blank counts.

14. The analyst is a critical part of this analytical procedure. Care must be taken to provide a non-stressful and comfortable environment for fiber counting. An ergonomically designed chair should be used, with the microscope eyepiece situated at a comfortable height for viewing. External lighting should be set at a level similar to the illumination level in the microscope to reduce eye fatigue. In addition, counters should take 10- to 20-minute breaks from the microscope every one or two hours to limit fatigue [14]. During these breaks, both eye and upper back/neck exercises should be performed to relieve strain.
15. All laboratories engaged in asbestos counting should participate in a proficiency testing program such as the AIHA-NIOSH Proficiency Analytical Testing (PAT) Program for asbestos and routinely exchange field samples with other laboratories to compare performance of counters.

MEASUREMENT:

16. Center the slide on the stage of the calibrated microscope under the objective lens. Focus the microscope on the plane of the filter.
17. Adjust the microscope (Step 10).

NOTE: Calibration with the HSE/NPL test slide determines the minimum detectable fiber diameter (ca. 0.25 µm) [4].

18. Counting rules: (same as P&CAM 239 rules [1,10,11]: see examples in APPENDIX B).

a. Count any fiber longer than 5 µm which lies entirely within the graticule area.
   (1) Count only fibers longer than 5 µm. Measure length of curved fibers along the curve.
   (2) Count only fibers with a length-to-width ratio equal to or greater than 3:1.

b. For fibers which cross the boundary of the graticule field:
   (1) Count as ½ fiber any fiber with only one end lying within the graticule area, provided that the fiber meets the criteria of rule a above.

(2) Do not count any fiber which crosses the graticule boundary more than once.
(3) Reject and do not count all other fibers.

c. Count bundles of fibers as one fiber unless individual fibers can be identified by observing both ends of a fiber.
d. Count enough graticule fields to yield 100 fibers. Count a minimum of 20 fields. Stop at 100 graticule fields regardless of count.

19. Start counting from the tip of the filter wedge and progress along a radial line to the outer edge. Shift up or down on the filter, and continue in the reverse direction. Select graticule fields randomly by looking away from the eyepiece briefly while advancing the mechanical stage. Ensure that, as a minimum, each analysis covers one radial line from the filter center to the outer edge of the filter. When an agglomerate or bubble covers ca. 1/6 or more of the graticule field, reject the graticule field and select another. Do not report rejected graticule fields in the total number counted.

NOTE 1: When counting a graticule field, continuously scan a range of focal planes by moving the fine focus knob to detect very fine fibers which have become embedded in the filter. The small-diameter fibers will be very faint but are an important contribution to the total count. A minimum counting time of 15 s per field is appropriate for accurate counting.

NOTE 2: This method does not allow for differentiation of fibers based on morphology. Although some experienced counters are capable of selectively counting only fibers which appear to be asbestiform, there is presently no accepted method for ensuring uniformity of judgment between laboratories. It is, therefore, incumbent upon all laboratories using this method to report total fiber counts. If serious contamination from non-asbestos fibers occurs in samples, other techniques such as transmission electron microscopy must be used to identify the asbestos fiber fraction present in the sample (see NIOSH Method 7402). In some cases (i.e., for fibers with diameters >1 µm), polarized light microscopy (as in NIOSH Method 7403) may be used to identify and eliminate interfering non-crystalline fibers [15].

NOTE 3: Do not count at edges where filter was cut. Move in at least 1 mm from the edge.

NOTE 4: Under certain conditions, electrostatic charge may affect the sampling of fibers. These electrostatic effects are most likely to occur when the relative humidity is low (below 20%), and when sampling is performed near the source of aerosol. The result is that deposition of fibers on the filter is reduced, especially near the edge of the filter. If such a pattern is noted during fiber counting, choose fields as close to the center of the filter as possible [5].

NOTE 5: Counts are to be recorded on a data sheet that provides, as a minimum, spaces on which to record the counts for each field, filter identification number, analyst's name, date, total fibers counted, total fields counted, average count, fiber density, and commentary. Average count is calculated by dividing the total fiber count by the number of fields observed. Fiber density (fibers/mm^2) is defined as the average count (fibers/field) divided by the field (graticule) area (mm^2/field).

CALCULATIONS AND REPORTING OF RESULTS

20. Calculate and report fiber density on the filter, E (fibers/mm^2), by dividing the average fiber count per graticule field, F / n_f, minus the mean field blank count per graticule field, B / n_b, by the graticule field area, A_f (approx. 0.00785 mm^2):

$$E = \frac{(F/n_f - B/n_b)}{A_f}, \text{ fibers/mm}^2.$$

NOTE: Fiber counts above 1300 fibers/mm^2 and fiber counts from samples with >50% of filter area covered with particulate should be reported as "uncountable" or "probably biased." Other fiber counts outside the 100–1300 fiber/mm^2 range should be reported as having "greater than optimal variability" and as being "probably biased."

21. Calculate and report the concentration, C (fibers/cc), of fibers in the air volume sampled, V (L), using the effective collection area of the filter, A_c (approx. 385 mm^2 for a 25-mm filter):

$$C = \frac{EA_c}{V \times 10^3}.$$

NOTE: Periodically check and adjust the value of A_c, if necessary.

22. Report intralaboratory and interlaboratory relative standard deviations (from Step 11) with each set of results.
    NOTE: Precision depends on the total number of fibers counted [1,16]. Relative standard deviation is documented in references [1,15–17] for fiber counts up to 100 fibers in 100 graticule fields. Comparability of interlaboratory results is discussed below. As a first approximation, use 213% above and 49% below the count as the upper and lower confidence limits for fiber counts greater than 20 (Figure 1).

EVALUATION OF METHOD:

Method Revisions:

This method is a revision of P&CAM 239 [10]. A summary of the revisions is as follows:

1. Sampling:
   The change from a 37-mm to a 25-mm filter improves sensitivity for similar air volumes. The change in flow rates allows for 2-m^3 full-shift samples to be taken, providing that the filter is not overloaded with non-fibrous particulates. The collection efficiency of the sampler is not a function of flow rate in the range 0.5 to 16 L/min [10].
2. Sample preparation technique:
   The acetone vapor-triacetin preparation technique is a faster, more permanent mounting technique than the dimethyl phthalate/diethyl oxalate method of P&CAM 239 [2,4,10]. The aluminum "hot block" technique minimizes the amount of acetone needed to prepare each sample.
3. Measurement:
   a. The Walton-Beckett graticule standardizes the area observed [14,18,19].
   b. The HSE/NPL test slide standardizes microscope optics for sensitivity to fiber diameter [4,14].
   c. Because of past inaccuracies associated with low fiber counts, the minimum recommended loading has been increased to 100 fibers/mm^2 filter area (a total of 78.5 fibers counted in 100 fields, each with field area = 0.00785 mm^2.) Lower levels generally result in an overestimate of the fiber count when compared to results in the recommended analytical range [20]. The recommended loadings should yield intracounter S_r in the range of 0.10 to 0.17 [21–23].

Interlaboratory Comparability:

An international collaborative study involved 16 laboratories using prepared slides from the asbestos cement, milling, mining, textile, and friction material industries [9]. The relative standard deviations (S_r) varied with sample type and laboratory. The ranges were:

Rules	Intralaboratory S_r	Interlaboratory S_r	Overall S_r
AIA (NIOSH A Rules)*	0.12 to 0.40	0.27 to 0.85	0.46
Modified CRS (NIOSH B Rules)†	0.11 to 0.29	0.20 to 0.35	0.25

*Under AIA rules, only fibers having a diameter less than 3 µm are counted and fibers attached to particles larger than 3 µm are not counted. NIOSH A Rules are otherwise similar to the AIA rules.

†See Appendix C.

A NIOSH study conducted using field samples of asbestos gave intralaboratory S_r in the range 0.17 to 0.25 and an interlaboratory S_r of 0.45 [21]. This agrees well with other recent studies [9,14,16].

At this time, there is no independent means for assessing the overall accuracy of this method. One measure of reliability is to estimate how well the count for a single sample agrees with the mean count from a large number of laboratories. The following discussion indicates how this estimation can be carried out based on measurements of the interlaboratory variability, as well as showing how the results of this method relate to the theoretically attainable counting precision and to measured intra- and interlaboratory S_r. (NOTE: The following discussion does not include bias estimates and should not be taken to indicate that lightly loaded samples are as accurate as properly loaded ones).

Theoretically, the process of counting randomly (Poisson) distributed fibers on a filter surface will give an S_r that depends on the number, N, of fibers counted:

$$S_r = 1/N^{1/2}.$$

Thus S_r is 0.1 for 100 fibers and 0.32 for 10 fibers counted. The actual S_r found in a number of studies is greater than these theoretical numbers [17,19–21].

An additional component of variability comes primarily from subjective interlaboratory differences. In a study of ten counters in a continuing sample exchange program, Ogden [15] found this subjective component of intralaboratory S_r to be approximately 0.2 and estimated the overall S_r by the term:

$$\frac{[N + (0.2 \times N)^2]^{1/2}}{N}.$$

Ogden found that the 90% confidence interval of the individual intralaboratory counts in relation to the means were +2 S_r and −1.5 S_r. In this program, one sample out of ten was a quality control sample. For laboratories not engaged in an intensive quality assurance program, the subjective component of variability can be higher.

In a study of field sample results in 46 laboratories, the Asbestos Information Association also found that the variability had both a constant component and one that depended on the fiber count [14]. These results gave a subjective interlaboratory component of S_r (on the same basis as Ogden's) for field samples of ca. 0.45. A similar value was obtained for 12 laboratories analyzing a set of 24 field samples [21]. This value falls slightly above the range of S_r (0.25 to 0.42 for 1984–85) found for 80 reference laboratories in the NIOSH PAT program for laboratory-generated samples [17].

A number of factors influence S_r for a given laboratory, such as that laboratory's actual counting performance and the type of samples being analyzed. In the absence of other information, such as from an interlaboratory quality assurance program using field samples, the value for the subjective component of variability is chosen as 0.45. It is hoped that the laboratories will carry out the recommended interlaboratory quality assurance programs to improve their performance and thus reduce the S_r.

The above relative standard deviations apply when the population mean has been determined. It is more useful, however, for laboratories to estimate the 90% confidence interval on the mean count from a single sample fiber count (Figure 1). These curves assume similar shapes of the count distribution for interlaboratory and intralaboratory results [16].

For example, if a sample yields a count of 24 fibers, Figure 1 indicates that the mean interlaboratory count will fall within the range of 227% above and 52% below that value 90% of the time. We can apply these percentages directly to the air concentrations as well. If, for instance, this sample (24 fibers counted) represented a 500-L volume, then the measured concentration is 0.02 fibers/mL (assuming 100 fields counted, 25-mm filter, 0.00785 mm^2 counting field area). If this same sample were counted by

a group of laboratories, there is a 90% probability that the mean would fall between 0.01 and 0.08 fiber/mL. These limits should be reported in any comparison of results between laboratories.

Note that the S_r of 0.45 used to derive Figure 1 is used as an estimate for a random group of laboratories. If several laboratories belonging to a quality assurance group can show that their interlaboratory S_r is smaller, then it is more correct to use that smaller S_r. However, the estimated S_r of 0.45 is to be used in the absence of such information. Note also that it has been found that S_r can be higher for certain types of samples, such as asbestos cement [9].

Quite often the estimated airborne concentration from an asbestos analysis is used to compare to a regulatory standard. For instance, if one is trying to show compliance with an 0.5 fiber/mL standard using a single sample on which 100 fibers have been counted, then Figure 1 indicates that the 0.5 fiber/mL standard must be 213% higher than the measured air concentration. This indicates that if one measures a fiber concentration of 0.16 fiber/mL (100 fibers counted), then the mean fiber count by a group of laboratories (of which the compliance laboratory might be one) has a 95% chance of being less than 0.5 fibers/mL; i.e., $0.16 + 2.13 \times 0.16 = 0.5$.

It can be seen from Figure 1 that the Poisson component of the variability is not very important unless the number of fibers counted is small. Therefore, a further approximation is to simply use +213% and −49% as the upper and lower confidence values of the mean for a 100-fiber count.

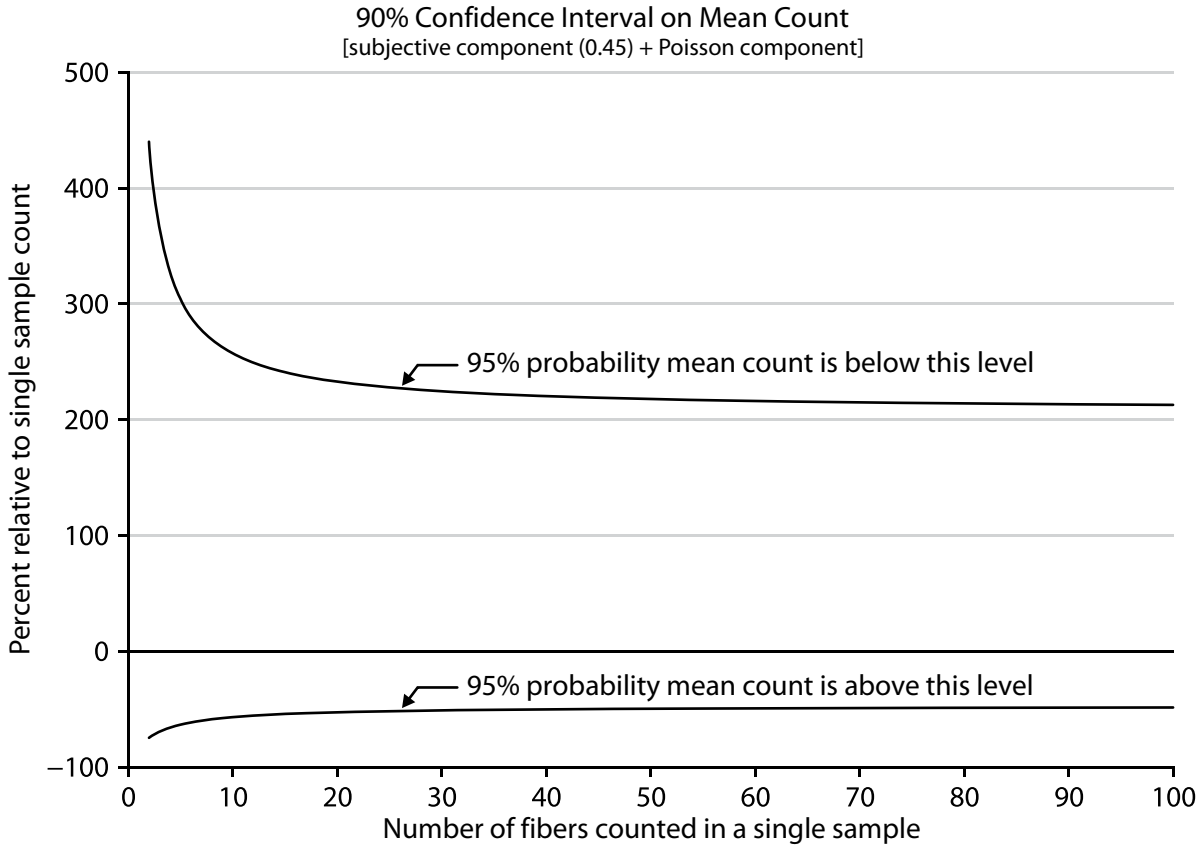


Figure 1. Interlaboratory precision of fiber counts.

The curves in Figure 1 are defined by the following equations:

$$U_{CL} = \frac{2X + 2.25 + [(2.25 + 2X)^2 - 4(1 - 2.25S_r^2)X^2]^{½}}{2(1 - 2.25S_r^2)} \text{ and}$$

$$L_{CL} = \frac{2X + 4 - [(4 + 2X)^2 - 4(1 - 4S_r^2)X^2]^{½}}{2(1 - 4S_r^2)},$$

where S_r = subjective interlaboratory relative standard deviation, which is close to the total interlaboratory S_r when approximately 100 fibers are counted,
X = total fibers counted on sample,
L_{CL} = lower 95% confidence limit, and
U_{CL} = upper 95% confidence limit.

Note that the range between these two limits represents 90% of the total range.

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APPENDIX A. CALIBRATION OF THE WALTON-BECKETT GRATICULE

Before ordering the Walton-Beckett graticule, the following calibration must be done to obtain a counting area (*D*) 100 µm in diameter at the image plane. The diameter, d_c (mm), of the circular counting area and the disc diameter must be specified when ordering the graticule.

1. Insert any available graticule into the eyepiece and focus so that the graticule lines are sharp and clear.
2. Set the appropriate interpupillary distance and, if applicable, reset the binocular head adjustment so that the magnification remains constant.
3. Install the 40 to 45× phase objective.
4. Place a stage micrometer on the microscope object stage and focus the microscope on the graduated lines.
5. Measure the magnified grid length of the graticule, L_o (µm), using the stage micrometer.
6. Remove the graticule from the microscope and measure its actual grid length, L_a (mm). This can best be accomplished by using a stage fitted with verniers.
7. Calculate the circle diameter, d_c (mm), for the Walton-Beckett graticule:

$$d_c = \frac{L_a}{L_o} \times D.$$

   Example: If L_o = 112 µm, L_a = 4.5 mm, and D = 100 µm, then d_c = 4.02 mm.
8. Check the field diameter, *D* (acceptable range 100 µm ± 2 µm) with a stage micrometer upon receipt of the graticule from the manufacturer. Determine field area (acceptable range 0.00754 mm^2 to 0.00817 mm^2).

APPENDIX B. COMPARISON OF COUNTING RULES

Figure 2 shows a Walton-Beckett graticule as seen through the microscope. The rules will be discussed as they apply to the labeled objects in the figure.

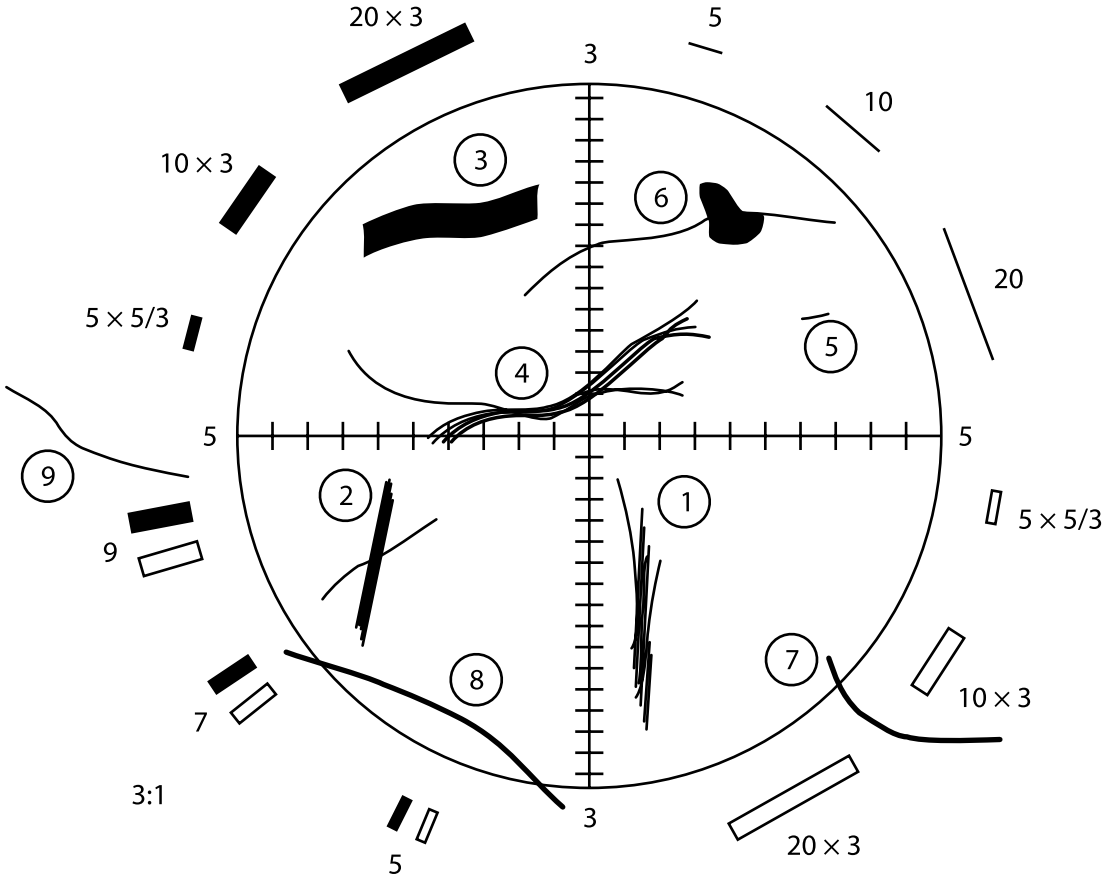

Figure 2. Walton-Beckett graticule with fibers.

These rules are sometimes referred to as the "A" rules:

Object	Count	Discussion
1	1 fiber	Optically observable asbestos fibers are actually bundles of fine fibrils. If the fibrils seem to be from the same bundle, the object is counted as a single fiber. Note, however, that all objects meeting length and aspect ratio criteria are counted whether or not they appear to be asbestos.
2	2 fibers	If fibers meeting the length and aspect ratio criteria (length >5 µm and length-to-width ratio > 3 to 1) overlap, but do not seem to be part of the same bundle, they are counted as separate fibers.
3	1 fiber	Although the object has a relatively large diameter (>3 µm), it is counted as fiber under the rules. There is no upper limit on the fiber diameter in the counting rules. Note that fiber width is measured at the widest compact section of the object.
4	1 fiber	Although long fine fibrils may extend from the body of a fiber, these fibrils are considered part of the fiber if they seem to have originally been part of the bundle.
5	Do not count	If the object is ≤ 5 µm long, it is not counted.
6	1 fiber	A fiber partially obscured by a particle is counted as one fiber. If the fiber ends emanating from a particle do not seem to be from the same fiber and each end meets the length and aspect ratio criteria, they are counted as separate fibers.
7	½ fiber	A fiber which crosses into the graticule area one time is counted as ½ fiber.
8	Do not count	Ignore fibers that cross the graticulate boundary more than once.
9	Do not count	Ignore fibers that lie outside the graticule boundary.

APPENDIX C. ALTERNATE COUNTING RULES FOR NON-ASBESTOS FIBERS

Other counting rules may be more appropriate for measurement of specific non-asbestos fiber types, such as fibrous glass. These include the "B" rules given below (from NIOSH Method 7400, Revision #2, dated 8/15/87), the World Health Organization reference method for man-made mineral fiber [24], and the NIOSH fibrous glass criteria document method [25]. The upper diameter limit in these methods prevents measurements of non-thoracic fibers. It is important to note that the aspect ratio limits included in these methods vary. NIOSH recommends the use of the 3:1 aspect ratio in counting fibers.

It is emphasized that hybridization of different sets of counting rules is not permitted. Report specifically which set of counting rules are used with the analytical results.

"B" Counting Rules

1. Count only *ends* of fibers. Each fiber must be longer than 5 µm and less than 3 µm diameter.
2. Count only ends of fibers with a length-to-width ratio equal to or greater than 5:1.
3. Count each fiber end which falls within the graticule area as one end, provided that the fiber meets rules 1 and 2 above. Add split ends to the count as appropriate if the split fiber segment also meets the criteria of rules 1 and 2 above.
4. Count visibly free ends which meet rules 1 and 2 above when the fiber appears to be attached to another particle, regardless of the size of the other particle. Count the end of a fiber obscured by another particle if the particle covering the fiber end is less than 3 µm in diameter.

5. Count free ends of fibers emanating from large clumps and bundles up to a maximum of 10 ends (5 fibers), provided that each segment meets rules 1 and 2 above.
6. Count enough graticule fields to yield 200 ends. Count a minimum of 20 graticule fields. Stop at 100 graticule fields, regardless of count.
7. Divide total end count by 2 to yield fiber count.

APPENDIX D. EQUIVALENT LIMITS OF DETECTION AND QUANTITATION

	Fiber density on filter*		Fiber concentration in air, f/cc	
	Fibers per 100 fields	Fibers/mm^2	400-L air sample	1000-L air sample
	200	255	0.25	0.10
	100	127	0.125	0.05
LOQ	80.0	102	0.10	0.04
	50	64	0.0625	0.025
	25	32	0.03	0.0125
	20	25	0.025	0.010
	10	12.7	0.0125	0.005
	8	10.2	0.010	0.004
LOD	5.5	7	0.00675	0.0027

*Assumes 385 mm^2 effective filter collection area, and field area = 0.00785 mm^2, for relatively "clean" (little particulate aside from fibers) filters.

AMEND: 340-248-0275

RULE TITLE: Emission Standards and Procedural Requirements: Asbestos Standards for Air Cleaning, Spraying, Molded Insulation, and Fabricating

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Made minor plain language edits.

RULE TEXT:

The following methods must be employed for air cleaning, fabricating, and sprayed-on and molded insulation applications:

(1) Options for Air Cleaning. Rather than meet the no visible emissions requirements of OAR 340-248-0210(1) and (3), owners and operators may elect to use methods specified in Section (2).

(2) Air Cleaning. All persons electing to use air cleaning methods rather than comply with the no visible emission requirements must comply with (a), (b), and (c) of this section:

(a) All persons electing to use air cleaning methods must meet one of the provisions in this subsection:

(A) Fabric filter collection devices must be used, except as provided in subsections (b) and (c) of this section. Such devices must be operated at a pressure drop of no more than four inches (10.16 cm) water gauge as measured across the filter fabric. The air flow permeability, as determined by ASTM Method D737-75, must not exceed 30 ft.3/min./ft.2 (9 m3/min./m2) for woven fabrics or 35 ft.3/min./ft.2 (11 m3/min./m2) for felted fabrics with the exception that airflow permeability of 40 ft.3/min./ft.2 (12 m3/min./m2) for woven and 45 ft.3/min./ft.2 (14 m3/min./m2) for felted fabrics must be allowed for filtering air emissions from asbestos ore dryers. Each square yard of felted fabric must weigh at least 14 ounces (475 grams per square meter) and be at least 1/16 inch (1.6 mm) thick throughout. Synthetic fabrics used must not contain fill yarn other than that which is spun;

(B) If using fabric filters creates a fire or explosion hazard, DEQ may authorize the use of wet collectors designed to operate with a unit contacting energy of at least 40 inches (101.6 cm) of water gauge pressure;

(C) If High Efficiency Particulate Air (HEPA) filters are used to control emissions the certified efficiency must be at least 99.97 percent for particles 0.3 microns or greater; or

(D) DEQ may authorize using filtering equipment other than that described in this section if such filtering equipment is satisfactorily demonstrated to provide filtering of asbestos material equivalent to that of the described equipment.

(b) All air cleaning devices this section authorizes must be properly installed, operated, and maintained. Devices to bypass the air cleaning equipment may be used only during upset and emergency conditions, and then only for such time as is necessary to shut down the operation generating the particulate asbestos material.

(c) Fabric filters collection devices installed after January 10, 1989 must be easily inspected for faulty bags.

(3) Spraying:

(a) No person may cause or allow to be discharged into the atmosphere visible emissions from a spray-on application of material containing more than one percent asbestos on a dry weight basis used to insulate or fireproof equipment or machinery, except as provided in section (2) of this rule. Spray-on materials used to insulate or fireproof buildings, structures, pipes, and conduits must contain less than one-percent asbestos on a dry weight basis. If a city or area of local jurisdiction has ordinances or regulations for spray application materials more stringent than those in this section, the provisions of such ordinances or regulations apply;

(b) A person intending to spray asbestos materials to insulate or fireproof buildings, structures, pipes, conduits, equipment, or machinery must notify DEQ in writing 20 days before the spraying operation begins. The notification must contain the following:

(A) Name and address of person intending to conduct the spraying operation;

(B) Address or location of the spraying operation;

(C) The name and address of the owner of the facility being sprayed.

(c) The spray-on application of materials in which the asbestos fibers are encapsulated with a bituminous or resinous binder during spraying and which are not friable after drying is exempted from the requirements of subsections (a) and

(b) of this section.
(4) Fabricating. Except as provided in section (2) of this rule no person may cause or allow to be discharged into the atmosphere visible emissions, including fugitive emissions, from fabricating operations including the following:
(a) Applicability. This section applies to the following fabricating operations using commercial asbestos:
(A) Fabricating cement building products;
(B) Fabricating friction products, except those operations that primarily install asbestos friction materials on motor vehicles; and
(C) Fabricating cement or silicate board for ventilation hoods; ovens; electrical panels; laboratory furniture; bulkheads, partitions, and ceilings for marine construction; and flow control devices for the molten metal industry.
(b) The owner or operator of a fabricating operation must monitor each potential source of asbestos emissions from any part of the fabricating facility, including air cleaning devices and process equipment for material processing and handling, at least once each day, during daylight hours, for visible emissions to the outside air during periods of operation. The monitoring must be by visual observation of at least 15 seconds duration per source of emissions.
(c) The owner or operator of a fabricating operation must inspect each air cleaning device at least once each week for proper operation and for changes that signal the potential for malfunctions, including to the maximum extent possible without dismantling other than opening the device, the presence of tears, holes, and abrasions in filter bags and for dust deposits on the clean side of bags. For air cleaning devices that cannot be inspected on a weekly basis according to this subsection, submit to the department, revise as necessary, and implement a written maintenance plan to include, at a minimum, a maintenance schedule and recordkeeping plan.
(d) The owner or operator of a fabricating operation must maintain records of the results of visible emission monitoring and air cleaning device inspections using a format approved by DEQ that includes the following information:
(A) Date and time of each inspection;
(B) Presence or absence of visible emissions;
(C) Condition of fabric filters, including presence of tears, holes, and abrasions;
(D) Presence of dust deposits on clean side of fabric filters;
(E) Brief description of corrective actions taken, including date and time; and
(F) Daily hours of operation for each air cleaning device.
(e) The owner or operator of a fabricating operation must furnish to DEQ upon request and make available at the affected facility during normal business hours for inspection by DEQ, all records required under this section.
(f) The owner or operator of a fabricating operation must retain a copy of all monitoring and inspection records for at least two years.
(g) The owner or operator of a fabricating operation must submit a copy of the visible emission monitoring records to DEQ quarterly. The quarterly report must be postmarked by the 30th day following the end of the calendar quarter.
(5) Insulation. No owner or operator of a facility may install or reinstall on a facility component any insulating materials that contain commercial asbestos if the materials are either molded and friable or wet-applied and friable after drying. The provisions of this section do not apply to insulating materials regulated under section (3) of this rule.
Note: Publications referenced are available from the agency.

STATUTORY/OTHER AUTHORITY: ORS 468.020, 468A.025, 468A.135, 468A.745

STATUTES/OTHER IMPLEMENTED: ORS 468A.700 - 468A.760

AMEND: 340-248-0280

RULE TITLE: Emission Standards and Procedural Requirements: Asbestos Disposal Requirements

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Updated asbestos disposal requirements and made minor plain language edits.

RULE TEXT:

Work practices and procedures for packaging, storing, transporting, and disposing of asbestos-containing waste material: The asbestos waste generator, transporter, owner or operator of a disposal site, and the owner or operator of other sources of asbestos-containing waste material must meet the following standards:

(1) There may be no visible emissions to the atmosphere during the collection; processing; packaging; transporting; or deposition of any asbestos-containing waste material.

(2) All asbestos-containing waste materials must be either:

(a) Processed into nonfriable pellets or other shapes; or

(b) Adequately wetted to ensure that they remain wet until delivered to a disposal site permitted to accept such material and packaged in leak-tight containers such as within two plastic bags, each with a minimum thickness of 6 mil., within a fiber or metal drum, or within a similar leak-tight packaging. Containers must be labeled as follows:

(A) The name of the asbestos waste generator and the location where the waste was generated; and

(B) A warning label that complies with either subparagraph (i) or (ii):

(i) A warning label that states the following in bold, all-capital letters and separated as shown here:

“DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
AVOID BREATHING AIRBORNE
ASBESTOS FIBERS”

(ii) Alternatively, warning labels specified by 29 C.F.R. 1926.1101(k)(7) may be used.

(C) The containers must be labeled prior to removal from the regulated area.

(3) If the asbestos-containing materials are not removed from a facility before demolition or renovation, as described in OAR 340-248-0270(5), adequately wet the asbestos-containing waste material at all times before and after demolition or renovation and keep it wet during handling and loading for transport to a permitted disposal site. Such asbestos-containing waste materials must be transported in lined and leak-tight covered containers for bulk disposal.

(4) The interim storage of asbestos-containing waste material must protect the waste from dispersal into the environment and provide physical security from tampering by unauthorized persons. The interim storage of asbestos-containing waste material is the responsibility of the owner or operator of the facility and of the person performing the asbestos abatement project.

(5) All asbestos-containing waste material must be deposited as soon as possible by the asbestos waste generator or transporter at:

(a) A permitted disposal site authorized by DEQ to receive asbestos-containing waste material and operated in accordance with this rule; or

(b) A DEQ approved site that converts asbestos-containing waste material into nonasbestos (asbestos-free) material according to the provisions of OAR 340-248-0230 Asbestos to Nonasbestos Conversion Operations.

(6) Persons disposing of asbestos-containing waste material must notify the permitted disposal site operator of the type and volume of the waste material and obtain the approval of the permitted disposal site operator before bringing the waste to the permitted disposal site.

(7) For each waste shipment the asbestos waste generator must record the following information on a DEQ form, and provide a copy of the form to the waste transporter.

(a) Waste Generation:

(A) The asbestos abatement project site name, address, and telephone number of the asbestos waste generator;
(B) A description of the asbestos-containing waste material and the number and type of asbestos-containing waste material containers and volume in cubic yards; and
(C) A certification that the information on the DEQ form is accurate and properly describes the generator name and that the asbestos-containing waste material is classified, packed, marked, and labeled, and is in all respects in proper condition for transport by highways according to applicable regulations.
(b) Waste Transportation:
(A) The date transported; and
(B) The name, address, and telephone number of the transporter.
(c) Waste Disposal:
(A) The name and telephone number of the disposal site operator;
(B) The name and address or location of the permitted disposal site;
(C) The quantity of the asbestos-containing waste material in cubic yards;
(D) The presence of improperly enclosed or uncovered waste, or an asbestos-containing waste material not sealed in leak-tight containers;
(E) The date asbestos-containing waste is received at disposal site; and
(d) Other information requested on the DEQ form.
(8) For the transportation of asbestos-containing waste material:
(a) The asbestos waste generator must:
(A) Maintain the asbestos waste shipment records for at least three years and ensure that all the information requested on the DEQ form regarding waste generation and transportation has been supplied;
(B) Limit access into loading and unloading area to authorized personnel; and
(C) Mark vehicles, while loading and unloading asbestos-containing waste material, with signs (20 in. x 14 in.) that comply with either subparagraph (i) or (ii):
(i) State the following in all-capital letters and separated as shown here:
“DANGER
ASBESTOS DUST HAZARD
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY”
(ii) Use language that conforms to the requirements of 29 C.F.R. 1926.1101(k)(8) (2013).
(b) The waste transporter must:
(A) Immediately notify the permitted disposal site operator upon arrival of the waste at the disposal site; and
(B) Provide a copy of the asbestos waste shipment record to the disposal site owners or operators when the asbestos-containing waste material is delivered to the disposal site.
(9) After initial transport of asbestos-containing waste material the asbestos waste generator must:
(a) Receive a copy of the completed asbestos waste shipment record within 35 days, or determine the status of the waste shipment. A completed asbestos waste shipment record must include the signature of the owner or operator of the designated disposal site;
(b) Receive a copy of the completed asbestos waste shipment record within 45 days, or submit to DEQ a written report including:
(A) A copy of the asbestos waste shipment record when a confirmation of delivery was not received; and
(B) A cover letter signed by the asbestos waste generator explaining the efforts taken to locate the asbestos waste shipment and the results of those efforts; and
(c) Keep asbestos waste shipment records, including a copy signed by the owner or operator of the designated permitted disposal site, for at least three years. Make all disposal records available upon request to DEQ. If a contractor licensed under OAR 340-248-0120 conducts the asbestos abatement project that generated the asbestos containing waste material, then the contractor must retain the records described in this section. For other asbestos abatement

projects, the owner or operator of the facility must retain the records.
(10) Each owner or operator of an active permitted disposal site authorized by DEQ to receive asbestos-containing waste materialmust meet the following standards:
(a) For all asbestos-containing waste material received:
(A) Ensure that off-loading of asbestos-containing waste material is done under the direction and supervision of the permitted disposal site operator or its authorized agent, and that it is accomplished in a manner that prevents the leak-tight transfer containers from rupturing and prevents the release of visible emissions to the air;
(B) Ensure that off-loading of asbestos-containing waste material occurs at the immediate location where the waste will be buried and restrict public access to off-loading area until waste is covered in accordance with paragraph (H), of this subsection;
(C) Maintain asbestos waste shipment records for at least two years and ensure that all information requested on the DEQ form regarding waste disposal has been supplied;
(D) Immediately notify DEQ by telephone, followed by a written report to DEQ the following working day, of the presence of improperly enclosed or uncovered waste. Submit a copy of the asbestos waste shipment record along with the report;
(E) As soon as possible, and no more than 30 days after receiving the waste, send a copy of the signed asbestos waste shipment record to the asbestos waste generator;
(F) Upon discovering a discrepancy between the quantity of waste designated on the asbestos waste shipment records and the quantity actually received, attempt to reconcile the discrepancy with the asbestos waste generator. Report in writing to DEQ discrepancies between the quantity of waste designated on the asbestos waste shipment records and the quantity actually received that cannot be reconciled between the asbestos waste generator and the permitted disposal site within 15 days after receiving the waste. Describe the discrepancy and attempts to reconcile it, and submit a copy of the asbestos waste shipment record along with the report. Include the DEQ assigned asbestos project number in the discrepancy report;
(G) Select the waste burial site in an area of minimal work activity that is not subject to future excavation; and
(H) Cover all asbestos-containing waste material deposited at the permitted disposal site with at least 12 inches of soil or six inches of soil plus 12 inches of other waste before running compacting equipment over it, and complete such covering and compaction no later than the end of the operating day that the waste is received.
(b) Maintain, until site closure, records of the location, depth and area, and quantity in cubic yards of asbestos-containing waste material within the permitted disposal site on a map or diagram of the disposal area.
(c) Excavation or disturbance of asbestos-containing waste material that has been deposited at a disposal site and is covered is considered an asbestos abatement project. The notification for such a project must be submitted as specified in OAR 340-248-0260 except as follows:
(A) Submit the project notification and project notification fee to DEQ at least 45 days before beginning excavation or disturbing asbestos-containing waste at the disposal site.
(B) State the reason for disturbing the waste.
(C) Explain the procedures for controlling emissions during the excavation, storage, transport and ultimate disposal of the excavated asbestos-containing waste material. DEQ may require changes in the proposed emission control procedures.
(D) State the location of the temporary storage site and the final permitted disposal site.
(d) Upon closure of an active asbestos-containing waste disposal site, each site owner or operator must:
(A) Comply with all the provisions for inactive asbestos-containing waste disposal sites;
(B) Submit to DEQ a copy of records of asbestos waste disposal locations and quantities; and
(C) Make available during normal business hours and furnish upon request all records required under this section for inspection by DEQ.
(11) The owner or operator of an inactive disposal site that accepted asbestos-containing waste material must meet the following standards:

(a) Maintain a cover of at least two feet of soil or one foot of soil plus one foot of other waste;
(b) Grow and maintain a cover of vegetation on the area to prevent erosion of the nonasbestos-containing cover of soil or other waste materials. In desert areas where vegetation would be difficult to maintain, a layer of at least three inches of well-graded, nonasbestos crushed rock may be placed and maintained on top of the final cover instead of vegetation;
(c) For inactive disposal sites with asbestos-containing tailings, a resinous or petroleum-based dust suppression agent that effectively binds dust to control surface air emissions may be used and maintained to achieve the requirements of subsections (a) and (b) of this section, provided the prior written approval of DEQ is obtained;
(d) Excavating or disturbing the inactive disposal site is an asbestos abatement project. The notification for such a project must be submitted as specified in OAR 340-248-0260, except as follows:
(A) Submit the project notification and project notification fee to DEQ at least 45 days before beginning excavation or disturbing an asbestos-containing waste disposal site;
(B) State the reason for disturbing the waste;
(C) Explain the procedures to be used to control emissions during the excavation, storage, transport and ultimate disposal of the excavated asbestos-containing waste material. DEQ may require changes in the proposed emission control procedures to be used; and
(D) State the location of the temporary storage site and the final disposal site; and
(e) Within 60 days of a site's becoming inactive, request in writing that the EQC issue an environmental hazard notice for the site. This environmental hazard notice will notify in perpetuity a potential purchaser of the property that:
(A) The land has been used for the disposal of asbestos-containing waste material;
(B) The survey plot and record of the location and quantity of asbestos-containing waste material disposed within the disposal site, as required for active asbestos disposal sites, have been filed with DEQ; and
(C) The site is subject to the provisions of OAR 340-248-0205 through 340-248-0280.
(12) Rather than meet the requirements of this rulea person may use alternative packaging, storage, transport, or disposal methods after receiving written approval by DEQ.

STATUTORY/OTHER AUTHORITY: ORS 468, 468A

STATUTES/OTHER IMPLEMENTED: ORS 468.020, 468A.025

REPEAL: 340-248-0290

RULE TITLE: Emission Standards and Procedural Requirements: Nonfriable Asbestos Disposal Requirements

NOTICE FILED DATE: 05/15/2018

RULE SUMMARY: Repealing rule.

RULE TEXT:

Work practices and procedures for packaging, storing, transporting, and disposal of nonfriable asbestos-containing waste material: The owner or operator of a facility or an activity covered under the provisions of OAR 340-248-0205 through 340-248-0290 and any other source of nonfriable asbestos-containing waste material must meet the following standard:

(1) Any waste that contains nonfriable asbestos material must be handled and disposed of using methods that will prevent the release of airborne asbestos-containing material.

(2) Rather than meet the requirements of this rule, an owner or operator may use alternative packaging, storage, transport, or disposal methods after receiving written approval from the Department.

STATUTORY/OTHER AUTHORITY: ORS 468.020, 468A.025, 468A.135, 468A.745

STATUTES/OTHER IMPLEMENTED: ORS 468A.700 - 468A.760

APPENDIX 5.0

ENVIRONMENTAL PROTECTION AGENCY LEAD PAINT

Title 40 - Protection of Environment
Chapter I - Environmental Protection Agency
Subchapter R - Toxic Substances Control Act

PART 745 - LEAD-BASED PAINT POISONING PREVENTION IN CERTAIN RESIDENTIAL STRUCTURES

Authority: 15 U.S.C. 2605, 2607, 2681-2692 and 42 U.S.C. 4852d.

Source: 61 FR 9085, Mar. 6, 1996, unless otherwise noted.

Subparts A-C [Reserved]

Subpart D - Lead-Based Paint Hazards

Source: 66 FR 1237, Jan. 5, 2001, unless otherwise noted.

§ 745.61 Scope and applicability.

(a) This subpart identifies lead-based paint hazards.

(b) The standards for lead-based paint hazards apply to target housing and child-occupied facilities.

(c) Nothing in this subpart requires the owner of property(ies) subject to these standards to evaluate the property(ies) for the presence of lead-based paint hazards or take any action to control these conditions if one or more of them is identified.

§ 745.63 Definitions.

The following definitions apply to part 745.

Arithmetic mean means the algebraic sum of data values divided by the number of data values (e.g., the sum of the concentration of lead in several soil samples divided by the number of samples).

Chewable surface means an interior or exterior surface painted with lead-based paint that a young child can mouth or chew. A chewable surface is the same as an "accessible surface" as defined in 42 U.S.C. 4851b(2)). Hard metal substrates and other materials that cannot be dented by the bite of a young child are not considered chewable.

Common area group means a group of common areas that are similar in design, construction, and function. Common area groups include, but are not limited to hallways, stairwells, and laundry rooms.

Concentration means the relative content of a specific substance contained within a larger mass, such as the amount of lead (in micrograms per gram or parts per million by weight) in a sample of dust or soil.

Deteriorated paint means any interior or exterior paint or other coating that is peeling, chipping, chalking or cracking, or any paint or coating located on an interior or exterior surface or fixture that is otherwise damaged or separated from the substrate.

Dripline means the area within 3 feet surrounding the perimeter of a building.

Friction surface means an interior or exterior surface that is subject to abrasion or friction, including, but not limited to, certain window, floor, and stair surfaces.

Impact surface means an interior or exterior surface that is subject to damage by repeated sudden force such as certain parts of door frames.

Interior window sill means the portion of the horizontal window ledge that protrudes into the interior of the room.

Lead-based paint hazard means hazardous lead-based paint, dust-lead hazard or soil-lead hazard as identified in § 745.65.

Loading means the quantity of a specific substance present per unit of surface area, such as the amount of lead in micrograms contained in the dust collected from a certain surface area divided by the surface area in square feet or square meters.

Mid-yard means an area of a residential yard approximately midway between the dripline of a residential building and the nearest property boundary or between the driplines of a residential building and another building on the same property.

Play area means an area of frequent soil contact by children of less than 6 years of age as indicated by, but not limited to, such factors including the following: the presence of play equipment (e.g., sandboxes, swing sets, and sliding boards), toys, or other children's possessions, observations of play patterns, or information provided by parents, residents, care givers, or property owners.

Residential building means a building containing one or more residential dwellings.

Room means a separate part of the inside of a building, such as a bedroom, living room, dining room, kitchen, bathroom, laundry room, or utility room. To be considered a separate room, the room must be separated from adjoining rooms by built-in walls or archways that extend at least 6 inches from an intersecting wall. Half walls or bookcases count as room separators if built-in. Movable or collapsible partitions or partitions consisting solely of shelves or cabinets are not considered built-in walls. A screened in porch that is used as a living area is a room.

Soil sample means a sample collected in a representative location using ASTM E1727, "Standard Practice for Field Collection of Soil Samples for Lead Determination by Atomic Spectrometry Techniques," or equivalent method.

Weighted arithmetic mean means the arithmetic mean of sample results weighted by the number of subsamples in each sample. Its purpose is to give influence to a sample relative to the surface area it represents. A single surface sample is comprised of a single subsample. A composite sample may contain from two to four subsamples of the same area as each other and of each single surface sample in the composite. The weighted arithmetic mean is obtained by summing, for all samples, the product of the sample's result multiplied by the number of subsamples in the sample, and dividing the sum by the total number of subsamples contained in all samples. For example, the weighted arithmetic mean of a single surface sample containing 60 $\mu g/ft^2$, a composite sample (three subsamples) containing 100 $\mu g/ft^2$, and a composite sample (4 subsamples) containing 110 $\mu g/ft^2$ is 100 $\mu g/ft^2$. This result is based on the equation [60 + (3*100) + (4*110)]/(1 + 3 + 4).

Window trough means, for a typical double-hung window, the portion of the exterior window sill between the interior window sill (or stool) and the frame of the storm window. If there is no storm window, the window trough is the area that receives both the upper and lower window sashes when they are both lowered. The window trough is sometimes referred to as the window "well."

Wipe sample means a sample collected by wiping a representative surface of known area, as determined by ASTM E1728, "Standard Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques, or equivalent method, with an acceptable wipe material as defined in ASTM E 1792, "Standard Specification for Wipe Sampling Materials for Lead in Surface Dust."

§ 745.65 Lead-based paint hazards.

(a) ***Paint-lead hazard.*** A paint-lead hazard is any of the following:

(1) Any lead-based paint on a friction surface that is subject to abrasion and where the lead dust levels on the nearest horizontal surface underneath the friction surface (e.g., the window sill, or floor) are equal to or greater than the dust-lead hazard levels identified in paragraph (b) of this section.

(2) Any damaged or otherwise deteriorated lead-based paint on an impact surface that is caused by impact from a related building component (such as a door knob that knocks into a wall or a door that knocks against its door frame.

(3) Any chewable lead-based painted surface on which there is evidence of teeth marks.

(4) Any other deteriorated lead-based paint in any residential building or child-occupied facility or on the exterior of any residential building or child-occupied facility.

(b) ***Dust-lead hazard.*** A dust-lead hazard is surface dust in a residential dwelling or child-occupied facility that contains a mass-per-area concentration of lead equal to or exceeding 10 μg/ft^2 on floors or 100 μg/ft^2 on interior window sills based on wipe samples.

(c) ***Soil-lead hazard.*** A soil-lead hazard is bare soil on residential real property or on the property of a child-occupied facility that contains total lead equal to or exceeding 400 parts per million (μg/g) in a play area or average of 1,200 parts per million of bare soil in the rest of the yard based on soil samples.

(d) ***Work practice requirements.*** Applicable certification, occupant protection, and clearance requirements and work practice standards are found in regulations issued by EPA at 40 CFR part 745, subpart L and in regulations issued by the Department of Housing and Urban Development (HUD) at 24 CFR part 35, subpart R. The work practice standards in those regulations do not apply when treating paint-lead hazards of less than:

(1) Two square feet of deteriorated lead-based paint per room or equivalent,

(2) Twenty square feet of deteriorated paint on the exterior building, or

(3) Ten percent of the total surface area of deteriorated paint on an interior or exterior type of component with a small surface area.

[66 FR 1237, Jan. 5, 2001, as amended at 84 FR 32648, July 9, 2019]

Subpart E - Residential Property Renovation

Source: 63 FR 29919, June 1, 1998, unless otherwise noted.

§ 745.80 Purpose.

This subpart contains regulations developed under sections 402 and 406 of the Toxic Substances Control Act (15 U.S.C. 2682 and 2686) and applies to all renovations performed for compensation in target housing and child-occupied facilities. The purpose of this subpart is to ensure the following:

(a) Owners and occupants of target housing and child-occupied facilities receive information on lead-based paint hazards before these renovations begin; and

(b) Individuals performing renovations regulated in accordance with § 745.82 are properly trained; renovators and firms performing these renovations are certified; and the work practices in § 745.85 are followed during these renovations.

[73 FR 21758, Apr. 22, 2008]

§ 745.81 Effective dates.

(a) ***Training, certification and accreditation requirements and work practice standards.*** The training, certification and accreditation requirements and work practice standards in this subpart are applicable in any State or Indian Tribal area that does not have a renovation program that is authorized under subpart Q of this part. The training, certification and accreditation requirements and work practice standards in this subpart will become effective as follows:

(1) ***Training programs.*** Effective June 23, 2008, no training program may provide, offer, or claim to provide training or refresher training for EPA certification as a renovator or a dust sampling technician without accreditation from EPA under § 745.225. Training programs may apply for accreditation under § 745.225 beginning April 22, 2009.

(2) ***Firms.***

(i) Firms may apply for certification under § 745.89 beginning October 22, 2009.

(ii) On or after April 22, 2010, no firm may perform, offer, or claim to perform renovations without certification from EPA under § 745.89 in target housing or child-occupied facilities, unless the renovation qualifies for one of the exceptions identified in § 745.82(a) or (c).

(3) ***Individuals.*** On or after April 22, 2010, all renovations must be directed by renovators certified in accordance with § 745.90(a) and performed by certified renovators or individuals trained in accordance with § 745.90(b)(2) in target housing or child-occupied facilities, unless the renovation qualifies for one of the exceptions identified in § 745.82(a) or (c).

(4) ***Work practices.***

(i) On or after April 22, 2010 and before July 6, 2010 all renovations must be performed in accordance with the work practice standards in § 745.85 and the associated recordkeeping requirements in § 745.86 (b)(6) in target housing or child-occupied facilities, unless the renovation qualifies for one of the exceptions identified in § 745.82(a). This does not apply to renovations in target housing for which the firm performing the renovation has obtained a statement signed by the owner that the renovation will occur in the owner's residence, no child under age 6 resides there, the housing is not a child-occupied facility, and the owner acknowledges that the work practices to be used during the renovation will not necessarily include all of the lead-safe work practices contained in EPA's renovation, repair, and painting rule. For the purposes of this section, a child resides in the primary residence of his or her custodial parents, legal guardians, and foster parents. A child also resides in the primary residence of an informal caretaker if the child lives and sleeps most of the time at the caretaker's residence.

(ii) On or after July 6, 2010, all renovations must be performed in accordance with the work practice standards in § 745.85 and the associated recordkeeping requirements in § 745.86(b)(1) and (b)(6) in target housing or child-occupied facilities, unless the renovation qualifies for the exception identified in § 745.82(a).

(5) The suspension and revocation provisions in § 745.91 are effective April 22, 2010.

(b) ***Renovation-specific pamphlet.*** Before December 22, 2008, renovators or firms performing renovations in States and Indian Tribal areas without an authorized program may provide owners and occupants with either of the following EPA pamphlets: *Protect Your Family From Lead in Your Home* or *Renovate Right:*

Important Lead Hazard Information for Families, Child Care Providers and Schools. After that date, *Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools* must be used exclusively.

(c) ***Pre-Renovation Education Rule.*** With the exception of the requirement to use the pamphlet entitled *Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools*, the provisions of the Pre-Renovation Education Rule in this subpart have been in effect since June 1999.

[73 FR 21758, Apr. 22, 2008, as amended at 75 FR 24818, May 6, 2010]

§ 745.82 Applicability.

(a) This subpart applies to all renovations performed for compensation in target housing and child-occupied facilities, except for the following:

(1) Renovations in target housing or child-occupied facilities in which a written determination has been made by an inspector or risk assessor (certified pursuant to either Federal regulations at § 745.226 or a State or Tribal certification program authorized pursuant to § 745.324) that the components affected by the renovation are free of paint or other surface coatings that contain lead equal to or in excess of 1.0 milligrams/per square centimeter (mg/cm^2) or 0.5% by weight, where the firm performing the renovation has obtained a copy of the determination.

(2) Renovations in target housing or child-occupied facilities in which a certified renovator, using an EPA recognized test kit as defined in § 745.83 and following the kit manufacturer's instructions, has tested each component affected by the renovation and determined that the components are free of paint or other surface coatings that contain lead equal to or in excess of 1.0 mg/cm^2 or 0.5% by weight. If the components make up an integrated whole, such as the individual stair treads and risers of a single staircase, the renovator is required to test only one of the individual components, unless the individual components appear to have been repainted or refinished separately.

(3) Renovations in target housing or child-occupied facilities in which a certified renovator has collected a paint chip sample from each painted component affected by the renovation and a laboratory recognized by EPA pursuant to section 405(b) of TSCA as being capable of performing analyses for lead compounds in paint chip samples has determined that the samples are free of paint or other surface coatings that contain lead equal to or in excess of 1.0 mg/cm^2 or 0.5% by weight. If the components make up an integrated whole, such as the individual stair treads and risers of a single staircase, the renovator is required to test only one of the individual components, unless the individual components appear to have been repainted or refinished separately.

(b) The information distribution requirements in § 745.84 do not apply to emergency renovations, which are renovation activities that were not planned but result from a sudden, unexpected event (such as non-routine failures of equipment) that, if not immediately attended to, presents a safety or public health hazard, or threatens equipment and/or property with significant damage. Interim controls performed in response to an elevated blood lead level in a resident child are also emergency renovations. Emergency renovations other than interim controls are also exempt from the warning sign, containment, waste handling, training, and certification requirements in §§ 745.85, 745.89, and 745.90 to the extent necessary to respond to the emergency. Emergency renovations are not exempt from the cleaning requirements of § 745.85(a)(5), which must be performed by certified renovators or individuals trained in accordance with § 745.90(b)(2), the cleaning verification requirements of § 745.85(b), which must be performed by certified renovators, and the recordkeeping requirements of § 745.86(b)(6) and (b)(7).

[73 FR 21758, Apr. 22, 2008, as amended at 75 FR 24818, May 6, 2010; 76 FR 47938, Aug. 5, 2011]

§ 745.83 Definitions.

For purposes of this part, the definitions in § 745.103 as well as the following definitions apply:

Administrator means the Administrator of the Environmental Protection Agency.

Child-occupied facility means a building, or portion of a building, constructed prior to 1978, visited regularly by the same child, under 6 years of age, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visits last at least 6 hours, and the combined annual visits last at least 60 hours. Child-occupied facilities may include, but are not limited to, day care centers, preschools and kindergarten classrooms. Child-occupied facilities may be located in target housing or in public or commercial buildings. With respect to common areas in public or commercial buildings that contain child-occupied facilities, the child-occupied facility encompasses only those common areas that are routinely used by children under age 6, such as restrooms and cafeterias. Common areas that children under age 6 only pass through, such as hallways, stairways, and garages are not included. In addition, with respect to exteriors of public or commercial buildings that contain child-occupied facilities, the child-occupied facility encompasses only the exterior sides of the building that are immediately adjacent to the child-occupied facility or the common areas routinely used by children under age 6.

Cleaning verification card means a card developed and distributed, or otherwise approved, by EPA for the purpose of determining, through comparison of wet and dry disposable cleaning cloths with the card, whether post-renovation cleaning has been properly completed.

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

Dry disposable cleaning cloth means a commercially available dry, electrostatically charged, white disposable cloth designed to be used for cleaning hard surfaces such as uncarpeted floors or counter tops.

Firm means a company, partnership, corporation, sole proprietorship or individual doing business, association, or other business entity; a Federal, State, Tribal, or local government agency; or a nonprofit organization.

HEPA vacuum means a vacuum cleaner which has been designed with a high-efficiency particulate air (HEPA) filter as the last filtration stage. A HEPA filter is a filter that is capable of capturing particulates of 0.3 microns with 99.97% efficiency. The vacuum cleaner must be designed so that all the air drawn into the machine is expelled through the HEPA filter with none of the air leaking past it. HEPA vacuums must be operated and maintained in accordance with the manufacturer's instructions.

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

Minor repair and maintenance activities are activities, including minor heating, ventilation or air conditioning work, electrical work, and plumbing, that disrupt 6 square feet or less of painted surface per room for interior activities or 20 square feet or less of painted surface for exterior activities where none of the work practices prohibited or restricted by § 745.85(a)(3) are used and where the work does not involve window replacement or demolition of painted surface areas. When removing painted components, or portions of painted components, the entire surface area removed is the amount of painted surface disturbed. Jobs, other than emergency renovations, performed in the same room within the same 30 days must be considered the same job for the purpose of determining whether the job is a minor repair and maintenance activity.

Painted surface means a component surface covered in whole or in part with paint or other surface coatings.

Pamphlet means the EPA pamphlet titled *Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools* developed under section 406(a) of TSCA for use in complying with section 406(b) of TSCA, or any State or Tribal pamphlet approved by EPA pursuant to 40 CFR 745.326 that is developed for the same purpose. This includes reproductions of the pamphlet when copied in full and without revision or deletion of material from the pamphlet (except for the addition or revision of State or local sources of information). Before December 22, 2008, the term "pamphlet" also means any pamphlet developed by EPA under section 406(a) of TSCA or any State or Tribal pamphlet approved by EPA pursuant to § 745.326.

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

Recognized test kit means a commercially available kit recognized by EPA under § 745.88 as being capable of allowing a user to determine the presence of lead at levels equal to or in excess of 1.0 milligrams per square centimeter, or more than 0.5% lead by weight, in a paint chip, paint powder, or painted surface.

Renovation means the modification of any existing structure, or portion thereof, that results in the disturbance of painted surfaces, unless that activity is performed as part of an abatement as defined by this part (40 CFR 745.223). The term renovation includes (but is not limited to): The removal, modification or repair of painted surfaces or painted components (e.g., modification of painted doors, surface restoration, window repair, surface preparation activity (such as sanding, scraping, or other such activities that may generate paint dust)); the removal of building components (e.g., walls, ceilings, plumbing, windows); weatherization projects (e.g., cutting holes in painted surfaces to install blown-in insulation or to gain access to attics, planing thresholds to install weather-stripping), and interim controls that disturb painted surfaces. A renovation performed for the purpose of converting a building, or part of a building, into target housing or a child-occupied facility is a renovation under this subpart. The term renovation does not include minor repair and maintenance activities.

Renovator means an individual who either performs or directs workers who perform renovations. A certified renovator is a renovator who has successfully completed a renovator course accredited by EPA or an EPA-authorized State or Tribal program.

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

Wet disposable cleaning cloth means a commercially available, pre-moistened white disposable cloth designed to be used for cleaning hard surfaces such as uncarpeted floors or counter tops.

Vertical containment means a vertical barrier consisting of plastic sheeting or other impermeable material over scaffolding or a rigid frame, or an equivalent system of containing the work area. Vertical containment is required for some exterior renovations but it may be used on any renovation.

Wet mopping system means a device with the following characteristics: A long handle, a mop head designed to be used with disposable absorbent cleaning pads, a reservoir for cleaning solution, and a built-in mechanism for distributing or spraying the cleaning solution onto a floor, or a method of equivalent efficacy.

Work area means the area that the certified renovator establishes to contain the dust and debris generated by a renovation.

[63 FR 29919, June 1, 1998, as amended at 73 FR 21758, Apr. 22, 2008; 76 FR 47938, Aug. 5, 2011]

§ 745.84 Information distribution requirements.

(a) ***Renovations in dwelling units.*** No more than 60 days before beginning renovation activities in any residential dwelling unit of target housing, the firm performing the renovation must:

(1) Provide the owner of the unit with the pamphlet, and comply with one of the following:

(i) Obtain, from the owner, a written acknowledgment that the owner has received the pamphlet.

(ii) Obtain a certificate of mailing at least 7 days prior to the renovation.

(2) In addition to the requirements in paragraph (a)(1) of this section, if the owner does not occupy the dwelling unit, provide an adult occupant of the unit with the pamphlet, and comply with one of the following:

(i) Obtain, from the adult occupant, a written acknowledgment that the occupant has received the pamphlet; or certify in writing that a pamphlet has been delivered to the dwelling and that the firm performing the renovation has been unsuccessful in obtaining a written acknowledgment from an adult occupant. Such certification must include the address of the unit undergoing renovation, the date and method of delivery of the pamphlet, names of the persons delivering the pamphlet, reason for lack of acknowledgment (e.g., occupant refuses to sign, no adult occupant available), the signature of a representative of the firm performing the renovation, and the date of signature.

(ii) Obtain a certificate of mailing at least 7 days prior to the renovation.

(b) ***Renovations in common areas.*** No more than 60 days before beginning renovation activities in common areas of multi-unit target housing, the firm performing the renovation must:

(1) Provide the owner with the pamphlet, and comply with one of the following:

(i) Obtain, from the owner, a written acknowledgment that the owner has received the pamphlet.

(ii) Obtain a certificate of mailing at least 7 days prior to the renovation.

(2) ***Comply with one of the following.***

(i) Notify in writing, or ensure written notification of, each affected unit and make the pamphlet available upon request prior to the start of renovation. Such notification shall be accomplished by distributing written notice to each affected unit. The notice shall describe the general nature and locations of the planned renovation activities; the expected starting and ending dates; and a statement of how the occupant can obtain the pamphlet and a copy of the records required by § 745.86(c) and (d), at no cost to the occupants, or

(ii) While the renovation is ongoing, post informational signs describing the general nature and locations of the renovation and the anticipated completion date. These signs must be posted in areas where they are likely to be seen by the occupants of all of the affected units. The signs must be accompanied by a posted copy of the pamphlet or information on how interested occupants can review a copy of the pamphlet or obtain a copy from the renovation firm at no cost to occupants. The signs must also include information on how interested occupants can review a copy of the records required by § 745.86(c) and (d) or obtain a copy from the renovation firm at no cost to the occupants.

(3) Prepare, sign, and date a statement describing the steps performed to notify all occupants of the intended renovation activities and to provide the pamphlet.

(4) If the scope, locations, or expected starting and ending dates of the planned renovation activities change after the initial notification, and the firm provided written initial notification to each affected unit, the firm performing the renovation must provide further written notification to the owners and occupants providing revised information on the ongoing or planned activities. This subsequent notification must be provided before the firm performing the renovation initiates work beyond that which was described in the original notice.

(c) ***Renovations in child-occupied facilities.*** No more than 60 days before beginning renovation activities in any child-occupied facility, the firm performing the renovation must:

(1)

(i) Provide the owner of the building with the pamphlet, and comply with one of the following:

(A) Obtain, from the owner, a written acknowledgment that the owner has received the pamphlet.

(B) Obtain a certificate of mailing at least 7 days prior to the renovation.

(ii) If the child-occupied facility is not the owner of the building, provide an adult representative of the child-occupied facility with the pamphlet, and comply with one of the following:

(A) Obtain, from the adult representative, a written acknowledgment that the adult representative has received the pamphlet; or certify in writing that a pamphlet has been delivered to the facility and that the firm performing the renovation has been unsuccessful in obtaining a written acknowledgment from an adult representative. Such certification must include the address of the child-occupied facility undergoing renovation, the date and method of delivery of the pamphlet, names of the persons delivering the pamphlet, reason for lack of acknowledgment (e.g., representative refuses to sign), the signature of a representative of the firm performing the renovation, and the date of signature.

(B) Obtain a certificate of mailing at least 7 days prior to the renovation.

(2) Provide the parents and guardians of children using the child-occupied facility with the pamphlet, information describing the general nature and locations of the renovation and the anticipated completion date, and information on how interested parents or guardians of children frequenting the child-occupied facility can review a copy of the records required by § 745.86(c) and (d) or obtain a copy from the renovation firm at no cost to the occupants by complying with one of the following:

(i) Mail or hand-deliver the pamphlet and the renovation information to each parent or guardian of a child using the child-occupied facility.

(ii) While the renovation is ongoing, post informational signs describing the general nature and locations of the renovation and the anticipated completion date. These signs must be posted in areas where they can be seen by the parents or guardians of the children frequenting the child-occupied facility. The signs must be accompanied by a posted copy of the pamphlet or information on how interested parents or guardians of children frequenting the child-occupied facility can review a copy of the pamphlet or obtain a copy from the renovation firm at no cost to the parents or guardians. The signs must also include information on how interested parents or guardians of children frequenting the child-occupied facility can review a copy of the records required by § 745.86(c) and (d) or obtain a copy from the renovation firm at no cost to the parents or guardians.

(3) The renovation firm must prepare, sign, and date a statement describing the steps performed to notify all parents and guardians of the intended renovation activities and to provide the pamphlet.

(d) ***Written acknowledgment.*** The written acknowledgments required by paragraphs (a)(1)(i), (a)(2)(i), (b)(1)(i), (c)(1)(i)(A), and (c)(1)(ii)(A) of this section must:

(1) Include a statement recording the owner or occupant's name and acknowledging receipt of the pamphlet prior to the start of renovation, the address of the unit undergoing renovation, the signature of the owner or occupant as applicable, and the date of signature.

(2) Be either a separate sheet or part of any written contract or service agreement for the renovation.

(3) Be written in the same language as the text of the contract or agreement for the renovation or, in the case of non-owner occupied target housing, in the same language as the lease or rental agreement or the pamphlet.

[63 FR 29919, June 1, 1998. Redesignated and amended at 73 FR 21760, Apr. 22, 2008; 75 FR 24818, May 6, 2010]

§ 745.85 Work practice standards.

(a) ***Standards for renovation activities.*** Renovations must be performed by certified firms using certified renovators as directed in § 745.89. The responsibilities of certified firms are set forth in § 745.89(d) and the responsibilities of certified renovators are set forth in § 745.90(b).

(1) ***Occupant protection.*** Firms must post signs clearly defining the work area and warning occupants and other persons not involved in renovation activities to remain outside of the work area. To the extent practicable, these signs must be in the primary language of the occupants. These signs must be posted before beginning the renovation and must remain in place and readable until the renovation and the post-renovation cleaning verification have been completed. If warning signs have been posted in accordance with 24 CFR 35.1345(b)(2) or 29 CFR 1926.62(m), additional signs are not required by this section.

(2) ***Containing the work area.*** Before beginning the renovation, the firm must isolate the work area so that no dust or debris leaves the work area while the renovation is being performed. In addition, the firm must maintain the integrity of the containment by ensuring that any plastic or other impermeable materials are not torn or displaced, and taking any other steps necessary to ensure that no dust or debris leaves the work area while the renovation is being performed. The firm must also ensure that containment is installed in such a manner that it does not interfere with occupant and worker egress in an emergency.

(i) ***Interior renovations.*** The firm must:

(A) Remove all objects from the work area, including furniture, rugs, and window coverings, or cover them with plastic sheeting or other impermeable material with all seams and edges taped or otherwise sealed.

(B) Close and cover all ducts opening in the work area with taped-down plastic sheeting or other impermeable material.

(C) Close windows and doors in the work area. Doors must be covered with plastic sheeting or other impermeable material. Doors used as an entrance to the work area must be covered with plastic sheeting or other impermeable material in a manner that allows workers to pass through while confining dust and debris to the work area.

(D) Cover the floor surface, including installed carpet, with taped-down plastic sheeting or other impermeable material in the work area 6 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to contain the dust, whichever is greater. Floor containment measures may stop at the edge of the vertical barrier when using a vertical containment system consisting of impermeable barriers that extend from the floor to the ceiling and are tightly sealed at joints with the floor, ceiling and walls.

(E) Use precautions to ensure that all personnel, tools, and other items, including the exteriors of containers of waste, are free of dust and debris before leaving the work area.

(ii) ***Exterior renovations.*** The firm must:

(A) Close all doors and windows within 20 feet of the renovation. On multi-story buildings, close all doors and windows within 20 feet of the renovation on the same floor as the renovation, and close all doors and windows on all floors below that are the same horizontal distance from the renovation.

(B) Ensure that doors within the work area that will be used while the job is being performed are covered with plastic sheeting or other impermeable material in a manner that allows workers to pass through while confining dust and debris to the work area.

(C) Cover the ground with plastic sheeting or other disposable impermeable material extending 10 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to collect falling paint debris, whichever is greater, unless the property line prevents 10 feet of such ground covering. Ground containment measures may stop at the edge of the vertical barrier when using a vertical containment system.

(D) If the renovation will affect surfaces within 10 feet of the property line, the renovation firm must erect vertical containment or equivalent extra precautions in containing the work area to ensure that dust and debris from the renovation does not contaminate adjacent buildings or migrate to adjacent properties. Vertical containment or equivalent extra

precautions in containing the work area may also be necessary in other situations in order to prevent contamination of other buildings, other areas of the property, or adjacent buildings or properties.

(3) ***Prohibited and restricted practices.*** The work practices listed below are prohibited or restricted during a renovation as follows:

(i) Open-flame burning or torching of painted surfaces is prohibited.

(ii) The use of machines designed to remove paint or other surface coatings through high speed operation such as sanding, grinding, power planing, needle gun, abrasive blasting, or sandblasting, is prohibited on painted surfaces unless such machines have shrouds or containment systems and are equipped with a HEPA vacuum attachment to collect dust and debris at the point of generation. Machines must be operated so that no visible dust or release of air occurs outside the shroud or containment system.

(iii) Operating a heat gun on painted surfaces is permitted only at temperatures below 1,100 degrees Fahrenheit.

(4) ***Waste from renovations.***

(i) Waste from renovation activities must be contained to prevent releases of dust and debris before the waste is removed from the work area for storage or disposal. If a chute is used to remove waste from the work area, it must be covered.

(ii) At the conclusion of each work day and at the conclusion of the renovation, waste that has been collected from renovation activities must be stored under containment, in an enclosure, or behind a barrier that prevents release of dust and debris out of the work area and prevents access to dust and debris.

(iii) When the firm transports waste from renovation activities, the firm must contain the waste to prevent release of dust and debris.

(5) ***Cleaning the work area.*** After the renovation has been completed, the firm must clean the work area until no dust, debris or residue remains.

(i) ***Interior and exterior renovations.*** The firm must:

(A) Collect all paint chips and debris and, without dispersing any of it, seal this material in a heavy-duty bag.

(B) Remove the protective sheeting. Mist the sheeting before folding it, fold the dirty side inward, and either tape shut to seal or seal in heavy-duty bags. Sheeting used to isolate contaminated rooms from non-contaminated rooms must remain in place until after the cleaning and removal of other sheeting. Dispose of the sheeting as waste.

(ii) ***Additional cleaning for interior renovations.*** The firm must clean all objects and surfaces in the work area and within 2 feet of the work area in the following manner, cleaning from higher to lower:

(A) ***Walls.*** Clean walls starting at the ceiling and working down to the floor by either vacuuming with a HEPA vacuum or wiping with a damp cloth.

(B) ***Remaining surfaces.*** Thoroughly vacuum all remaining surfaces and objects in the work area, including furniture and fixtures, with a HEPA vacuum. The HEPA vacuum must be equipped with a beater bar when vacuuming carpets and rugs.

(C) Wipe all remaining surfaces and objects in the work area, except for carpeted or upholstered surfaces, with a damp cloth. Mop uncarpeted floors thoroughly, using a mopping method that keeps the wash water separate from the rinse water, such as the 2-bucket mopping method, or using a wet mopping system.

(b) ***Standards for post-renovation cleaning verification*** -

(1) ***Interiors.***

(i) A certified renovator must perform a visual inspection to determine whether dust, debris or residue is still present. If dust, debris or residue is present, these conditions must be removed by re-cleaning and another visual inspection must be performed.

(ii) After a successful visual inspection, a certified renovator must:

(A) Verify that each windowsill in the work area has been adequately cleaned, using the following procedure.

(*1*) Wipe the windowsill with a wet disposable cleaning cloth that is damp to the touch. If the cloth matches or is lighter than the cleaning verification card, the windowsill has been adequately cleaned.

(*2*) If the cloth does not match and is darker than the cleaning verification card, re-clean the windowsill as directed in paragraphs (a)(5)(ii)(B) and (a)(5)(ii)(C) of this section, then either use a new cloth or fold the used cloth in such a way that an unused surface is exposed, and wipe the surface again. If the cloth matches or is lighter than the cleaning verification card, that windowsill has been adequately cleaned.

(*3*) If the cloth does not match and is darker than the cleaning verification card, wait for 1 hour or until the surface has dried completely, whichever is longer.

(*4*) After waiting for the windowsill to dry, wipe the windowsill with a dry disposable cleaning cloth. After this wipe, the windowsill has been adequately cleaned.

(B) Wipe uncarpeted floors and countertops within the work area with a wet disposable cleaning cloth. Floors must be wiped using an application device with a long handle and a head to which the cloth is attached. The cloth must remain damp at all times while it is being used to wipe the surface for post-renovation cleaning verification. If the surface within the work area is greater than 40 square feet, the surface within the work area must be divided into roughly equal sections that are each less than 40 square feet. Wipe each such section separately with a new wet disposable cleaning cloth. If the cloth used to wipe each section of the surface within the work area matches the cleaning verification card, the surface has been adequately cleaned.

(*1*) If the cloth used to wipe a particular surface section does not match the cleaning verification card, re-clean that section of the surface as directed in paragraphs (a)(5)(ii)(B) and (a)(5)(ii)(C) of this section, then use a new wet disposable cleaning cloth to wipe that section again. If the cloth matches the cleaning verification card, that section of the surface has been adequately cleaned.

(2) If the cloth used to wipe a particular surface section does not match the cleaning verification card after the surface has been re-cleaned, wait for 1 hour or until the entire surface within the work area has dried completely, whichever is longer.

(3) After waiting for the entire surface within the work area to dry, wipe each section of the surface that has not yet achieved post-renovation cleaning verification with a dry disposable cleaning cloth. After this wipe, that section of the surface has been adequately cleaned.

(iii) When the work area passes the post-renovation cleaning verification, remove the warning signs.

(2) ***Exteriors.*** A certified renovator must perform a visual inspection to determine whether dust, debris or residue is still present on surfaces in and below the work area, including windowsills and the ground. If dust, debris or residue is present, these conditions must be eliminated and another visual inspection must be performed. When the area passes the visual inspection, remove the warning signs.

(c) ***Optional dust clearance testing.*** Cleaning verification need not be performed if the contract between the renovation firm and the person contracting for the renovation or another Federal, State, Territorial, Tribal, or local law or regulation requires:

(1) The renovation firm to perform dust clearance sampling at the conclusion of a renovation covered by this subpart.

(2) The dust clearance samples are required to be collected by a certified inspector, risk assessor or dust sampling technician.

(3) The renovation firm is required to re-clean the work area until the dust clearance sample results are below the clearance standards in § 745.227(e)(8) or any applicable State, Territorial, Tribal, or local standard.

(d) ***Activities conducted after post-renovation cleaning verification.*** Activities that do not disturb paint, such as applying paint to walls that have already been prepared, are not regulated by this subpart if they are conducted after post-renovation cleaning verification has been performed.

[73 FR 21761, Apr. 22, 2008, as amended at 76 FR 47938, Aug. 5, 2011]

§ 745.86 Recordkeeping and reporting requirements.

(a) Firms performing renovations must retain and, if requested, make available to EPA all records necessary to demonstrate compliance with this subpart for a period of 3 years following completion of the renovation. This 3-year retention requirement does not supersede longer obligations required by other provisions for retaining the same documentation, including any applicable State or Tribal laws or regulations.

(b) Records that must be retained pursuant to paragraph (a) of this section shall include (where applicable):

(1) Records or reports certifying that a determination had been made that lead-based paint was not present on the components affected by the renovation, as described in § 745.82(a). These records or reports include:

(i) Reports prepared by a certified inspector or certified risk assessor (certified pursuant to either Federal regulations at § 745.226 or an EPA-authorized State or Tribal certification program).

(ii) Records prepared by a certified renovator after using EPA-recognized test kits, including an identification of the manufacturer and model of any test kits used, a description of the components that were tested including their locations, and the result of each test kit used.

(iii) Records prepared by a certified renovator after collecting paint chip samples, including a description of the components that were tested including their locations, the name and address of the NLLAP-recognized entity performing the analysis, and the results for each sample.

(2) Signed and dated acknowledgments of receipt as described in § 745.84(a)(1)(i), (a)(2)(i), (b)(1)(i), (c)(1)(i)(A), and (c)(1)(ii)(A).

(3) Certifications of attempted delivery as described in § 745.84(a)(2)(i) and (c)(1)(ii)(A).

(4) Certificates of mailing as described in § 745.84(a)(1)(ii), (a)(2)(ii), (b)(1)(ii), (c)(1)(i)(B), and (c)(1)(ii)(B).

(5) Records of notification activities performed regarding common area renovations, as described in § 745.84(b)(3) and (b)(4), and renovations in child-occupied facilities, as described in § 745.84(c)(2).

(6) Documentation of compliance with the requirements of § 745.85, including documentation that a certified renovator was assigned to the project, that the certified renovator provided on-the-job training for workers used on the project, that the certified renovator performed or directed workers who performed all of the tasks described in § 745.85(a), and that the certified renovator performed the post-renovation cleaning verification described in § 745.85(b). If the renovation firm was unable to comply with all of the requirements of this rule due to an emergency as defined in § 745.82, the firm must document the nature of the emergency and the provisions of the rule that were not followed. This documentation must include a copy of the certified renovator's training certificate, and a certification by the certified renovator assigned to the project that:

(i) Training was provided to workers (topics must be identified for each worker).

(ii) Warning signs were posted at the entrances to the work area.

(iii) If test kits were used, that the specified brand of kits was used at the specified locations and that the results were as specified.

(v) The work area was contained by:

(A) Removing or covering all objects in the work area (interiors).

(B) Closing and covering all HVAC ducts in the work area (interiors).

(C) Closing all windows in the work area (interiors) or closing all windows in and within 20 feet of the work area (exteriors).

(D) Closing and sealing all doors in the work area (interiors) or closing and sealing all doors in and within 20 feet of the work area (exteriors).

(E) Covering doors in the work area that were being used to allow passage but prevent spread of dust.

(F) Covering the floor surface, including installed carpet, with taped-down plastic sheeting or other impermeable material in the work area 6 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to contain the dust, whichever is greater (interiors) or covering the ground with plastic sheeting or other disposable impermeable material anchored to the building extending 10 feet beyond the perimeter of surfaces

undergoing renovation or a sufficient distance to collect falling paint debris, whichever is greater, unless the property line prevents 10 feet of such ground covering, weighted down by heavy objects (exteriors).

(G) Installing (if necessary) vertical containment to prevent migration of dust and debris to adjacent property (exteriors).

(iv) If paint chip samples were collected, that the samples were collected at the specified locations, that the specified NLLAP-recognized laboratory analyzed the samples, and that the results were as specified.

(vi) Waste was contained on-site and while being transported off-site.

(vii) The work area was properly cleaned after the renovation by:

(A) Picking up all chips and debris, misting protective sheeting, folding it dirty side inward, and taping it for removal.

(B) Cleaning the work area surfaces and objects using a HEPA vacuum and/or wet cloths or mops (interiors).

(viii) The certified renovator performed the post-renovation cleaning verification (the results of which must be briefly described, including the number of wet and dry cloths used).

(c)

(1) When the final invoice for the renovation is delivered or within 30 days of the completion of the renovation, whichever is earlier, the renovation firm must provide information pertaining to compliance with this subpart to the following persons:

(i) The owner of the building; and, if different,

(ii) An adult occupant of the residential dwelling, if the renovation took place within a residential dwelling, or an adult representative of the child-occupied facility, if the renovation took place within a child-occupied facility.

(2) When performing renovations in common areas of multi-unit target housing, renovation firms must post the information required by this subpart or instructions on how interested occupants can obtain a copy of this information. This information must be posted in areas where it is likely to be seen by the occupants of all of the affected units.

(3) The information required to be provided by paragraph (c) of this section may be provided by completing the sample form titled “Sample Renovation Recordkeeping Checklist” or a similar form containing the test kit information required by § 745.86(b)(1)(ii) and the training and work practice compliance information required by § 745.86(b)(6).

(d) If dust clearance sampling is performed in lieu of cleaning verification as permitted by § 745.85(c), the renovation firm must provide, when the final invoice for the renovation is delivered or within 30 days of the completion of the renovation, whichever is earlier, a copy of the dust sampling report to:

(1) The owner of the building; and, if different,

(2) An adult occupant of the residential dwelling, if the renovation took place within a residential dwelling, or an adult representative of the child-occupied facility, if the renovation took place within a child-occupied facility.

(3) When performing renovations in common areas of multi-unit target housing, renovation firms must post these dust sampling reports or information on how interested occupants of the housing being renovated can obtain a copy of the report. This information must be posted in areas where they are likely to be seen by the occupants of all of the affected units.

[73 FR 21761, Apr. 22, 2008, as amended at 75 FR 24819, May 6, 2010; 76 FR 47939, Aug. 5, 2011]

§ 745.87 Enforcement and inspections.

(a) Failure or refusal to comply with any provision of this subpart is a violation of TSCA section 409 (15 U.S.C. 2689).

(b) Failure or refusal to establish and maintain records or to make available or permit access to or copying of records, as required by this subpart, is a violation of TSCA sections 15 and 409 (15 U.S.C. 2614 and 2689).

(c) Failure or refusal to permit entry or inspection as required by 40 CFR 745.87 and TSCA section 11 (15 U.S.C. 2610) is a violation of sections 15 and 409 (15 U.S.C. 2614 and 2689).

(d) Violators may be subject to civil and criminal sanctions pursuant to TSCA section 16 (15 U.S.C. 2615) for each violation.

(e) Lead-based paint is assumed to be present at renovations covered by this subpart. EPA may conduct inspections and issue subpoenas pursuant to the provisions of TSCA section 11 (15 U.S.C. 2610) to ensure compliance with this subpart.

[63 FR 29919, June 1, 1998, as amended at 73 FR 21763, Apr. 22, 2008]

§ 745.88 Recognized test kits.

(a) Effective June 23, 2008, EPA recognizes the test kits that have been determined by National Institute of Standards and Technology research to meet the negative response criteria described in paragraph (c)(1) of this section. This recognition will last until EPA publicizes its recognition of the first test kit that meets both the negative response and positive response criteria in paragraph (c) of this section.

(b) No other test kits will be recognized until they are tested through EPA's Environmental Technology Verification Program or other equivalent EPA approved testing program.

(1) Effective September 1, 2008, to initiate the testing process, a test kit manufacturer must submit a sufficient number of kits, along with the instructions for using the kits, to EPA. The test kit manufacturer should first visit the following website for information on where to apply: *http://www.epa.gov/etv/howtoapply.html*.

(2) After the kit has been tested through the Environmental Technology Verification Program or other equivalent approved EPA testing program, EPA will review the report to determine whether the required criteria have been met.

(3) Before September 1, 2010, test kits must meet only the negative response criteria in paragraph (c)(1) of this section. The recognition of kits that meet only this criteria will last until EPA publicizes its recognition of the first test kits that meets both of the criteria in paragraph (c) of this section.

(4) After September 1, 2010, test kits must meet both of the criteria in paragraph (c) of this section.

(5) If the report demonstrates that the kit meets the required criteria, EPA will issue a notice of recognition to the kit manufacturer, provide them with the report, and post the information on EPA's website.

(6) If the report demonstrates that the kit does not meet the required criteria, EPA will notify the kit manufacturer and provide them with the report.

(c) ***Response criteria*** -

(1) ***Negative response criteria.*** For paint containing lead at or above the regulated level, 1.0 mg/cm^2 or 0.5% by weight, a demonstrated probability (with 95% confidence) of a negative response less than or equal to 5% of the time.

(2) ***Positive response criteria.*** For paint containing lead below the regulated level, 1.0 mg/cm^2 or 0.5% by weight, a demonstrated probability (with 95% confidence) of a positive response less than or equal to 10% of the time.

[73 FR 21763, Apr. 22, 2008]

§ 745.89 Firm certification.

(a) ***Initial certification.***

(1) Firms that perform renovations for compensation must apply to EPA for certification to perform renovations or dust sampling. To apply, a firm must submit to EPA a completed "Application for Firms," signed by an authorized agent of the firm, and pay at least the correct amount of fees. If a firm pays more than the correct amount of fees, EPA will reimburse the firm for the excess amount.

(2) After EPA receives a firm's application, EPA will take one of the following actions within 90 days of the date the application is received:

(i) EPA will approve a firm's application if EPA determines that it is complete and that the environmental compliance history of the firm, its principals, or its key employees does not show an unwillingness or inability to maintain compliance with environmental statutes or regulations. An application is complete if it contains all of the information requested on the form and includes at least the correct amount of fees. When EPA approves a firm's application, EPA will issue the firm a certificate with an expiration date not more than 5 years from the date the application is approved. EPA certification allows the firm to perform renovations covered by this section in any State or Indian Tribal area that does not have a renovation program that is authorized under subpart Q of this part.

(ii) EPA will request a firm to supplement its application if EPA determines that the application is incomplete. If EPA requests a firm to supplement its application, the firm must submit the requested information or pay the additional fees within 30 days of the date of the request.

(iii) EPA will not approve a firm's application if the firm does not supplement its application in accordance with paragraph (a)(2)(ii) of this section or if EPA determines that the environmental compliance history of the firm, its principals, or its key employees demonstrates an unwillingness or inability to maintain compliance with environmental statutes or regulations. EPA will send the firm a letter giving the reason for not approving the application. EPA will not refund the application fees. A firm may reapply for certification at any time by filing a new, complete application that includes the correct amount of fees.

(b) ***Re-certification.*** To maintain its certification, a firm must be re-certified by EPA every 5 years.

(1) ***Timely and complete application.*** To be re-certified, a firm must submit a complete application for re-certification. A complete application for re-certification includes a completed "Application for Firms" which contains all of the information requested by the form and is signed by an authorized agent of the firm, noting on the form that it is submitted as a re-certification. A complete application must also include at least the correct amount of fees. If a firm pays more than the correct amount of fees, EPA will reimburse the firm for the excess amount.

(i) An application for re-certification is timely if it is postmarked 90 days or more before the date the firm's current certification expires. If the firm's application is complete and timely, the firm's current certification will remain in effect until its expiration date or until EPA has made a final decision to approve or disapprove the re-certification application, whichever is later.

(ii) If the firm submits a complete re-certification application less than 90 days before its current certification expires, and EPA does not approve the application before the expiration date, the firm's current certification will expire and the firm will not be able to conduct renovations until EPA approves its re-certification application.

(iii) If the firm fails to obtain recertification before the firm's current certification expires, the firm must not perform renovations or dust sampling until it is certified anew pursuant to paragraph (a) of this section.

(2) ***EPA action on an application.*** After EPA receives a firm's application for re-certification, EPA will review the application and take one of the following actions within 90 days of receipt:

(i) EPA will approve a firm's application if EPA determines that it is timely and complete and that the environmental compliance history of the firm, its principals, or its key employees does not show an unwillingness or inability to maintain compliance with environmental statutes or regulations. When EPA approves a firm's application for re-certification, EPA will issue the firm a new certificate with an expiration date 5 years from the date that the firm's current certification expires. EPA certification allows the firm to perform renovations or dust sampling covered by this section in any State or Indian Tribal area that does not have a renovation program that is authorized under subpart Q of this part.

(ii) EPA will request a firm to supplement its application if EPA determines that the application is incomplete.

(iii) EPA will not approve a firm's application if it is not received or is not complete as of the date that the firm's current certification expires, or if EPA determines that the environmental compliance history of the firm, its principals, or its key employees demonstrates an unwillingness or inability to maintain compliance with environmental statutes or regulations. EPA will send the firm a letter giving the reason for not approving the application. EPA will not refund the application fees. A firm may reapply for certification at any time by filing a new application and paying the correct amount of fees.

(c) ***Amendment of certification.*** A firm must amend its certification within 90 days of the date a change occurs to information included in the firm's most recent application. If the firm fails to amend its certification within 90 days of the date the change occurs, the firm may not perform renovations or dust sampling until its certification is amended.

(1) To amend a certification, a firm must submit a completed "Application for Firms," signed by an authorized agent of the firm, noting on the form that it is submitted as an amendment and indicating the information that has changed. The firm must also pay at least the correct amount of fees.

(2) If additional information is needed to process the amendment, or the firm did not pay the correct amount of fees, EPA will request the firm to submit the necessary information or fees. The firm's certification is not amended until the firm complies with the request.

(3) Amending a certification does not affect the certification expiration date.

(d) ***Firm responsibilities.*** Firms performing renovations must ensure that:

(1) All individuals performing renovation activities on behalf of the firm are either certified renovators or have been trained by a certified renovator in accordance with § 745.90.

(2) A certified renovator is assigned to each renovation performed by the firm and discharges all of the certified renovator responsibilities identified in § 745.90.

(3) All renovations performed by the firm are performed in accordance with the work practice standards in § 745.85.

(4) The pre-renovation education requirements of § 745.84 have been performed.

(5) The recordkeeping requirements of § 745.86 are met.

[73 FR 21764, Apr. 22, 2008]

§ 745.90 Renovator certification and dust sampling technician certification.

(a) ***Renovator certification and dust sampling technician certification.***

(1) To become a certified renovator or certified dust sampling technician, an individual must successfully complete the appropriate course accredited by EPA under § 745.225 or by a State or Tribal program that is authorized under subpart Q of this part. The course completion certificate serves as proof of certification. EPA renovator certification allows the certified individual to perform renovations covered by this section in any State or Indian Tribal area that does not have a renovation program that is authorized under subpart Q of this part. EPA dust sampling technician certification allows the certified individual to perform dust clearance sampling under § 745.85(c) in any State or Indian Tribal area that does not have a renovation program that is authorized under subpart Q of this part.

(2) Individuals who have successfully completed an accredited abatement worker or supervisor course, or individuals who successfully completed an EPA, HUD, or EPA/HUD model renovation training course before October 4, 2011 may take an accredited refresher renovator training course that includes hands-on training in lieu of the initial renovator training course to become a certified renovator.

(3) Individuals who have successfully completed an accredited lead-based paint inspector or risk assessor course October 4, 2011 may take an accredited refresher dust sampling technician course in lieu of the initial training to become a certified dust sampling technician. Individuals who are currently certified as lead-based paint inspectors or risk assessors may act as certified dust sampling technicians without further training.

(4) To maintain renovator certification or dust sampling technician certification, an individual must complete a renovator or dust sampling technician refresher course accredited by EPA under § 745.225 or by a State or Tribal program that is authorized under subpart Q of this part within 5 years of the date the individual completed the initial course described in paragraph (a)(1) of this section. If the individual does not complete a refresher course within this time, the individual must re-take the initial course to become certified again. Individuals who complete a renovator course accredited by EPA or an EPA authorized program on or before March 31, 2010, must complete a renovator refresher course accredited by EPA or an EPA authorized program on or before March 31, 2016, to maintain renovator certification. Individuals who completed a renovator course accredited by EPA or an EPA authorized program between April 1, 2010 and March 31, 2011, will have one year added to their original 5-year certification. Individuals who take a renovator refresher course that does not include hands-on training will be certified for 3 years from the date they complete the training. Individuals who take a refresher training course that includes hands-on training will be certified for 5 years. Individuals who take the renovator refresher without hands-on training must, for their next refresher course, take a refresher course that includes hands-on training to maintain renovator certification.

(b) ***Renovator responsibilities.*** Certified renovators are responsible for ensuring compliance with § 745.85 at all renovations to which they are assigned. A certified renovator:

(1) Must perform all of the tasks described in § 745.85(b) and must either perform or direct workers who perform all of the tasks described in § 745.85(a).

(2) Must provide training to workers on the work practices required by § 745.85(a) that they will be using in performing their assigned tasks.

(3) Must be physically present at the work site when the signs required by § 745.85(a)(1) are posted, while the work area containment required by § 745.85(a)(2) is being established, and while the work area cleaning required by § 745.85(a)(5) is performed.

(4) Must regularly direct work being performed by other individuals to ensure that the work practices required by § 745.85(a) are being followed, including maintaining the integrity of the containment barriers and ensuring that dust or debris does not spread beyond the work area.

(5) Must be available, either on-site or by telephone, at all times that renovations are being conducted.

(6) When requested by the party contracting for renovation services, must use an acceptable test kit to determine whether components to be affected by the renovation contain lead-based paint.

(7) Must have with them at the work site copies of their initial course completion certificate and their most recent refresher course completion certificate.

(8) Must prepare the records required by § 745.86(b)(1)(ii) and (6).

(c) ***Dust sampling technician responsibilities.*** When performing optional dust clearance sampling under § 745.85(c), a certified dust sampling technician:

(1) Must collect dust samples in accordance with § 745.227(e)(8), must send the collected samples to a laboratory recognized by EPA under TSCA section 405(b), and must compare the results to the clearance levels in accordance with § 745.227(e)(8).

(2) Must have with them at the work site copies of their initial course completion certificate and their most recent refresher course completion certificate.

[73 FR 21765, Apr. 22, 2008, as amended at 75 FR 24819, May 6, 2010; 76 FR 47939, Aug. 5, 2011; 80 FR 20446, Apr. 16, 2015; 81 FR 7995, Feb. 17, 2016]

§ 745.91 Suspending, revoking, or modifying an individual's or firm's certification.

(a)

(1) ***Grounds for suspending, revoking, or modifying an individual's certification.*** EPA may suspend, revoke, or modify an individual's certification if the individual fails to comply with Federal lead-based paint statutes or regulations. EPA may also suspend, revoke, or modify a certified renovator's certification if the renovator fails to ensure that all assigned renovations comply with § 745.85. In addition to an administrative or judicial finding of violation, execution of a consent agreement in settlement of an enforcement action constitutes, for purposes of this section, evidence of a failure to comply with relevant statutes or regulations.

(2) ***Grounds for suspending, revoking, or modifying a firm's certification.*** EPA may suspend, revoke, or modify a firm's certification if the firm:

(i) Submits false or misleading information to EPA in its application for certification or re-certification.

(ii) Fails to maintain or falsifies records required in § 745.86.

(iii) Fails to comply, or an individual performing a renovation on behalf of the firm fails to comply, with Federal lead-based paint statutes or regulations. In addition to an administrative or judicial finding of violation, execution of a consent agreement in settlement of an enforcement action constitutes, for purposes of this section, evidence of a failure to comply with relevant statutes or regulations.

(b) ***Process for suspending, revoking, or modifying certification.***

(1) Prior to taking action to suspend, revoke, or modify an individual's or firm's certification, EPA will notify the affected entity in writing of the following:

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

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

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

(iv) The opportunity and method for requesting a hearing prior to final suspension, revocation, or modification.

(2) If an individual or firm requests a hearing, EPA will:

(i) Provide the affected entity an opportunity to offer written statements in response to EPA's assertions of the legal and factual basis for its proposed action.

(ii) Appoint an impartial official of EPA as Presiding Officer to conduct the hearing.

(3) The Presiding Officer will:

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

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

(iii) Notify the affected entity in writing within 90 days of completion of the hearing of his or her decision and order. Such an order is a final agency action which may be subject to judicial review. The order must contain the commencement date and duration of the suspension, revocation, or modification.

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

(i) Notify the affected entity in accordance with paragraph (b)(1)(i) through (b)(1)(iii) of this section, explaining why it is necessary to suspend the entity's certification before an opportunity for a hearing.

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

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

(6) EPA will maintain a publicly available list of entities whose certification has been suspended, revoked, modified, or reinstated.

(7) Unless the decision and order issued under paragraph (b)(3)(iii) of this section specify otherwise:

(i) An individual whose certification has been suspended must take a refresher training course (renovator or dust sampling technician) in order to make his or her certification current.

(ii) An individual whose certification has been revoked must take an initial renovator or dust sampling technician course in order to become certified again.

(iii) A firm whose certification has been revoked must reapply for certification after the revocation ends in order to become certified again. If the firm's certification has been suspended and the suspension ends less than 5 years after the firm was initially certified or re-certified, the firm does not need to do anything to re-activate its certification.

[73 FR 21765, Apr. 22, 2008]

§ 745.92 Fees for the accreditation of renovation and dust sampling technician training and the certification of renovation firms.

(a) ***Persons who must pay fees.*** Fees in accordance with paragraph (b) of this section must be paid by:

(1) ***Training programs*** -

(i) ***Non-exempt training programs.*** All non-exempt training programs applying to EPA for the accreditation and re-accreditation of training programs in one or more of the following disciplines: Renovator, dust sampling technician.

(ii) ***Exemption.*** No fee shall be imposed on any training program operated by a State, federally recognized Indian Tribe, local government, or non-profit organization. This exemption does not apply to the certification of firms or individuals.

(2) ***Firms.*** All firms applying to EPA for certification and re-certification to conduct renovations.

(b) ***Fee amounts*** -

(1) ***Certification and accreditation fees.*** Initial and renewal certification and accreditation fees are specified in the following table:

Training Program	Accreditation	Re-accreditation (every 4 years, see 40 CFR 745.225(f)(1) for details)
Initial Renovator or Dust Sampling Technician Course	$560	$340
Refresher Renovator or Dust Sampling Technician Course	$400	$310
Renovation Firm	Certification	Re-certification (every 5 years see 40 CFR 745.89(b))
Firm	$300	$300
Combined Renovation and Lead-based Paint Activities Firm Application	$550	$550
Combined Renovation and Lead-based Paint Activities Tribal Firm Application	$20	$20
Tribal Firm	$20	$20

(2) ***Lost certificate.*** A $15 fee will be charged for the replacement of a firm certificate.

(c) ***Certificate replacement.*** Firms seeking certificate replacement must:

(1) Complete the applicable portions of the “Application for Firms” in accordance with the instructions provided.

(2) Submit the application and a payment of $15 in accordance with the instructions provided with the application package.

(3) ***Accreditation or certification amendments.*** No fee will be charged for accreditation or certification amendments.

(d) ***Failure to remit fees.***

(1) EPA will not provide certification, re-certification, accreditation, or re-accreditation for any firm or training program that does not remit fees described in paragraph (b) of this section in accordance with the procedures specified in 40 CFR 745.89.

(2) EPA will not replace a certificate for any firm that does not remit the $15 fee in accordance with the procedures specified in paragraph (c) of this section.

[74 FR 11869, Mar. 20, 2009, as amended at 76 FR 47939, Aug. 5, 2011]

Subpart F - Disclosure of Known Lead-Based Paint and/or Lead-Based Paint Hazards Upon Sale or Lease of Residential Property

§ 745.100 Purpose.

This subpart implements the provisions of 42 U.S.C. 4852d, which impose certain requirements on the sale or lease of target housing. Under this subpart, a seller or lessor of target housing shall disclose to the purchaser or lessee the presence of any known lead-based paint and/or lead-based paint hazards; provide available records and reports; provide the purchaser or lessee with a lead hazard information pamphlet; give purchasers a 10-day opportunity to conduct a risk assessment or inspection; and attach specific disclosure and warning language to the sales or leasing contract before the purchaser or lessee is obligated under a contract to purchase or lease target housing.

§ 745.101 Scope and applicability.

This subpart applies to all transactions to sell or lease target housing, including subleases, with the exception of the following:

(a) Sales of target housing at foreclosure.

(b) Leases of target housing that have been found to be lead-based paint free by an inspector certified under the Federal certification program or under a federally accredited State or tribal certification program. Until a Federal certification program or federally accredited State certification program is in place within the State, inspectors shall be considered qualified to conduct an inspection for this purpose if they have received certification under any existing State or tribal inspector certification program. The lessor has the option of using the results of additional test(s) by a certified inspector to confirm or refute a prior finding.

(c) Short-term leases of 100 days or less, where no lease renewal or extension can occur.

(d) Renewals of existing leases in target housing in which the lessor has previously disclosed all information required under § 745.107 and where no new information described in § 745.107 has come into the possession of the lessor. For the purposes of this paragraph, renewal shall include both renegotiation of existing lease terms and/or ratification of a new lease.

§ 745.102 Effective dates.

The requirements in this subpart take effect in the following manner:

(a) For owners of more than four residential dwellings, the requirements shall take effect on September 6, 1996.

(b) For owners of one to four residential dwellings, the requirements shall take effect on December 6, 1996.

§ 745.103 Definitions.

The following definitions apply to this subpart.

The Act means the Residential Lead-Based Paint Hazard Reduction Act of 1992, 42 U.S.C. 4852d.

Agent means any party who enters into a contract with a seller or lessor, including any party who enters into a contract with a representative of the seller or lessor, for the purpose of selling or leasing target housing. This term does not apply to purchasers or any purchaser's representative who receives all compensation from the purchaser.

Available means in the possession of or reasonably obtainable by the seller or lessor at the time of the disclosure.

Common area means a portion of a building generally accessible to all residents/users including, but not limited to, hallways, stairways, laundry and recreational rooms, playgrounds, community centers, and boundary fences.

Contract for the purchase and sale of residential real property means any contract or agreement in which one party agrees to purchase an interest in real property on which there is situated one or more residential dwellings used or occupied, or intended to be used or occupied, in whole or in part, as the home or residence of one or more persons.

EPA means the Environmental Protection Agency.

Evaluation means a risk assessment and/or inspection.

Foreclosure means any of the various methods, statutory or otherwise, known in different jurisdictions, of enforcing payment of a debt, by the taking and selling of real property.

Housing for the elderly means retirement communities or similar types of housing reserved for households composed of one or more persons 62 years of age or more at the time of initial occupancy.

HUD means the U.S. Department of Housing and Urban Development.

Inspection means:

(1) A surface-by-surface investigation to determine the presence of lead-based paint as provided in section 302(c) of the Lead-Based Paint Poisoning and Prevention Act [42 U.S.C. 4822], and

(2) The provision of a report explaining the results of the investigation.

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

Lead-based paint free housing means target housing that has been found to be free of paint or other surface coatings that contain lead equal to or in excess of 1.0 milligram per square centimeter or 0.5 percent by weight.

Lead-based paint hazard means any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, or lead-contaminated paint that is deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects as established by the appropriate Federal agency.

Lessee means any entity that enters into an agreement to lease, rent, or sublease target housing, including but not limited to individuals, partnerships, corporations, trusts, government agencies, housing agencies, Indian tribes, and nonprofit organizations.

Lessor means any entity that offers target housing for lease, rent, or sublease, including but not limited to individuals, partnerships, corporations, trusts, government agencies, housing agencies, Indian tribes, and nonprofit organizations.

Owner means any entity that has legal title to target housing, including but not limited to individuals, partnerships, corporations, trusts, government agencies, housing agencies, Indian tribes, and nonprofit organizations, except where a mortgagee holds legal title to property serving as collateral for a mortgage loan, in which case the owner would be the mortgagor.

Purchaser means an entity that enters into an agreement to purchase an interest in target housing, including but not limited to individuals, partnerships, corporations, trusts, government agencies, housing agencies, Indian tribes, and nonprofit organizations.

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

Residential dwelling means:

(1) A single-family dwelling, including attached structures such as porches and stoops; or

(2) A single-family dwelling unit in a structure that contains more than one separate residential dwelling unit, and in which each such unit is used or occupied, or intended to be used or occupied, in whole or in part, as the residence of one or more persons.

Risk assessment means an on-site investigation to determine and report the existence, nature, severity, and location of lead-based paint hazards in residential dwellings, including:

(1) Information gathering regarding the age and history of the housing and occupancy by children under age 6;

(2) Visual inspection;

(3) Limited wipe sampling or other environmental sampling techniques;

(4) Other activity as may be appropriate; and

(5) Provision of a report explaining the results of the investigation.

Secretary means the Secretary of Housing and Urban Development.

Seller means any entity that transfers legal title to target housing, in whole or in part, in return for consideration, including but not limited to individuals, partnerships, corporations, trusts, government agencies, housing agencies, Indian tribes, and nonprofit organizations. The term "seller" also includes:

(1) An entity that transfers shares in a cooperatively owned project, in return for consideration; and

(2) An entity that transfers its interest in a leasehold, in jurisdictions or circumstances where it is legally permissible to separate the fee title from the title to the improvement, in return for consideration.

Target housing means any housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any child who is less than 6 years of age resides or is expected to reside in such housing) or any 0-bedroom dwelling.

TSCA means the Toxic Substances Control Act, 15 U.S.C. 2601.

0-bedroom dwelling means any residential dwelling in which the living area is not separated from the sleeping area. The term includes efficiencies, studio apartments, dormitory housing, military barracks, and rentals of individual rooms in residential dwellings.

§ 745.107 Disclosure requirements for sellers and lessors.

(a) The following activities shall be completed before the purchaser or lessee is obligated under any contract to purchase or lease target housing that is not otherwise an exempt transaction pursuant to § 745.101. Nothing in this section implies a positive obligation on the seller or lessor to conduct any evaluation or reduction activities.

(1) The seller or lessor shall provide the purchaser or lessee with an EPA-approved lead hazard information pamphlet. Such pamphlets include the EPA document entitled *Protect Your Family From Lead in Your Home* (EPA #747-K-94-001) or an equivalent pamphlet that has been approved for use in that State by EPA.

(2) The seller or lessor shall disclose to the purchaser or lessee the presence of any known lead-based paint and/or lead-based paint hazards in the target housing being sold or leased. The seller or lessor shall also disclose any additional information available concerning the known lead-based paint and/or lead-based paint hazards, such as the basis for the determination that lead-based paint and/or lead-based paint hazards exist, the location of the lead-based paint and/or lead-based paint hazards, and the condition of the painted surfaces.

(3) The seller or lessor shall disclose to each agent the presence of any known lead-based paint and/or lead-based paint hazards in the target housing being sold or leased and the existence of any available records or reports pertaining to lead-based paint and/or lead-based paint hazards. The seller or lessor shall also disclose any additional information available concerning the known lead-based paint and/or lead-based paint hazards, such as the basis for the determination that lead-based paint and/or lead-based paint hazards exist, the location of the lead-based paint and/or lead-based paint hazards, and the condition of the painted surfaces.

(4) The seller or lessor shall provide the purchaser or lessee with any records or reports available to the seller or lessor pertaining to lead-based paint and/or lead-based paint hazards in the target housing being sold or leased. This requirement includes records or reports regarding common areas. This requirement also includes records or reports regarding other residential dwellings in multifamily target housing, provided that such information is part of an evaluation or reduction of lead-based paint and/or lead-based paint hazards in the target housing as a whole.

(b) If any of the disclosure activities identified in paragraph (a) of this section occurs after the purchaser or lessee has provided an offer to purchase or lease the housing, the seller or lessor shall complete the required disclosure activities prior to accepting the purchaser's or lessee's offer and allow the purchaser or lessee an opportunity to review the information and possibly amend the offer.

§ 745.110 Opportunity to conduct an evaluation.

(a) Before a purchaser is obligated under any contract to purchase target housing, the seller shall permit the purchaser a 10-day period (unless the parties mutually agree, in writing, upon a different period of time) to conduct a risk assessment or inspection for the presence of lead-based paint and/or lead-based paint hazards.

(b) Not withstanding paragraph (a) of this section, a purchaser may waive the opportunity to conduct the risk assessment or inspection by so indicating in writing.

§ 745.113 Certification and acknowledgment of disclosure.

(a) ***Seller requirements.*** Each contract to sell target housing shall include an attachment containing the following elements, in the language of the contract (e.g., English, Spanish):

(1) A Lead Warning Statement consisting of the following language:

> Every purchaser of any interest in residential real property on which a residential dwelling was built prior to 1978 is notified that such property may present exposure to lead from lead-based paint that may place young children at risk of developing lead poisoning. Lead poisoning in young children may produce permanent neurological damage, including learning disabilities, reduced intelligence quotient, behavioral

problems, and impaired memory. Lead poisoning also poses a particular risk to pregnant women. The seller of any interest in residential real property is required to provide the buyer with any information on lead-based paint hazards from risk assessments or inspections in the seller's possession and notify the buyer of any known lead-based paint hazards. A risk assessment or inspection for possible lead-based paint hazards is recommended prior to purchase.

(2) A statement by the seller disclosing the presence of known lead-based paint and/or lead-based paint hazards in the target housing being sold or indicating no knowledge of the presence of lead-based paint and/or lead-based paint hazards. The seller shall also provide any additional information available concerning the known lead-based paint and/or lead-based paint hazards, such as the basis for the determination that lead-based paint and/or lead-based paint hazards exist, the location of the lead-based paint and/or lead-based paint hazards, and the condition of the painted surfaces.

(3) A list of any records or reports available to the seller pertaining to lead-based paint and/or lead-based paint hazards in the housing that have been provided to the purchaser. If no such records or reports are available, the seller shall so indicate.

(4) A statement by the purchaser affirming receipt of the information set out in paragraphs (a)(2) and (a)(3) of this section and the lead hazard information pamphlet required under 15 U.S.C. 2696.

(5) A statement by the purchaser that he/she has either:

(i) Received the opportunity to conduct the risk assessment or inspection required by § 745.110(a); or

(ii) Waived the opportunity.

(6) When one or more agents are involved in the transaction to sell target housing on behalf of the seller, a statement that:

(i) The agent has informed the seller of the seller's obligations under 42 U.S.C. 4852d; and

(ii) The agent is aware of his/her duty to ensure compliance with the requirements of this subpart.

(7) The signatures of the sellers, agents, and purchasers certifying to the accuracy of their statements to the best of their knowledge, along with the dates of signature.

(b) ***Lessor requirements.*** Each contract to lease target housing shall include, as an attachment or within the contract, the following elements, in the language of the contract (e.g., English, Spanish):

(1) A Lead Warning Statement with the following language:

Housing built before 1978 may contain lead-based paint. Lead from paint, paint chips, and dust can pose health hazards if not managed properly. Lead exposure is especially harmful to young children and pregnant women. Before renting pre-1978 housing, lessors must disclose the presence of lead-based paint and/or lead-based paint hazards in the dwelling. Lessees must also receive a federally approved pamphlet on lead poisoning prevention.

(2) A statement by the lessor disclosing the presence of known lead-based paint and/or lead-based paint hazards in the target housing being leased or indicating no knowledge of the presence of lead-based paint and/or lead-based paint hazards. The lessor shall also disclose any additional

information available concerning the known lead-based paint and/or lead-based paint hazards, such as the basis for the determination that lead-based paint and/or lead-based paint hazards exist, the location of the lead-based paint and/or lead-based paint hazards, and the condition of the painted surfaces.

(3) A list of any records or reports available to the lessor pertaining to lead-based paint and/or lead-based paint hazards in the housing that have been provided to the lessee. If no such records or reports are available, the lessor shall so indicate.

(4) A statement by the lessee affirming receipt of the information set out in paragraphs (b)(2) and (b)(3) of this section and the lead hazard information pamphlet required under 15 U.S.C. 2696.

(5) When one or more agents are involved in the transaction to lease target housing on behalf of the lessor, a statement that:

(i) The agent has informed the lessor of the lessor as obligations under 42 U.S.C. 4852d; and

(ii) The agent is aware of his/her duty to ensure compliance with the requirements of this subpart.

(6) The signatures of the lessors, agents, and lessees, certifying to the accuracy of their statements, to the best of their knowledge, along with the dates of signature.

(c) ***Retention of Certification and Acknowledgment Information.***

(1) The seller, and any agent, shall retain a copy of the completed attachment required under paragraph (a) of this section for no less than 3 years from the completion date of the sale. The lessor, and any agent, shall retain a copy of the completed attachment or lease contract containing the information required under paragraph (b) of this section for no less than 3 years from the commencement of the leasing period.

(2) This recordkeeping requirement is not intended to place any limitations on civil suits under the Act, or to otherwise affect a lessee's or purchaser's rights under the civil penalty provisions of 42 U.S.C. 4852d(b)(3).

(d) The seller, lessor, or agent shall not be responsible for the failure of a purchaser's or lessee's legal representative (where such representative receives all compensation from the purchaser or lessee) to transmit disclosure materials to the purchaser or lessee, provided that all required parties have completed and signed the necessary certification and acknowledgment language required under paragraphs (a) and (b) of this section.

§ 745.115 Agent responsibilities.

(a) Each agent shall ensure compliance with all requirements of this subpart. To ensure compliance, the agent shall:

(1) Inform the seller or lessor of his/her obligations under §§ 745.107, 745.110, and 745.113.

(2) Ensure that the seller or lessor has performed all activities required under §§ 745.107, 745.110, and 745.113, or personally ensure compliance with the requirements of §§ 745.107, 745.110, and 745.113.

(b) If the agent has complied with paragraph (a)(1) of this section, the agent shall not be liable for the failure to disclose to a purchaser or lessee the presence of lead-based paint and/or lead-based paint hazards known by a seller or lessor but not disclosed to the agent.

§ 745.118 Enforcement.

(a) Any person who knowingly fails to comply with any provision of this subpart shall be subject to civil monetary penalties in accordance with the provisions of 42 U.S.C. 3545 and 24 CFR part 30.

(b) The Secretary is authorized to take such action as may be necessary to enjoin any violation of this subpart in the appropriate Federal district court.

(c) Any person who knowingly violates the provisions of this subpart shall be jointly and severally liable to the purchaser or lessee in an amount equal to 3 times the amount of damages incurred by such individual.

(d) In any civil action brought for damages pursuant to 42 U.S.C. 4852d(b)(3), the appropriate court may award court costs to the party commencing such action, together with reasonable attorney fees and any expert witness fees, if that party prevails.

(e) Failure or refusal to comply with § 745.107 (disclosure requirements for sellers and lessors), § 745.110 (opportunity to conduct an evaluation), § 745.113 (certification and acknowledgment of disclosure), or § 745.115 (agent responsibilities) is a violation of 42 U.S.C. 4852d(b)(5) and of TSCA section 409 (15 U.S.C. 2689).

(f) Violators may be subject to civil and criminal sanctions pursuant to TSCA section 16 (15 U.S.C. 2615) for each violation. For purposes of enforcing this subpart, the penalty for each violation applicable under 15 U.S.C. 2615 shall not be more than $11,000 for all violations occuring after July 28, 1997; all violations occuring on or prior to that date are subject to a penalty not more than $10,000.

[61 FR 9085, Mar. 6, 1996, as amended at 62 FR 35041, June 27, 1997]

§ 745.119 Impact on State and local requirements.

Nothing in this subpart shall relieve a seller, lessor, or agent from any responsibility for compliance with State or local laws, ordinances, codes, or regulations governing notice or disclosure of known lead-based paint or lead-based paint hazards. Neither HUD nor EPA assumes any responsibility for ensuring compliance with such State or local requirements.

Subparts G-K [Reserved]

Subpart L - Lead-Based Paint Activities

Source: 61 FR 45813, Aug. 29, 1996, unless otherwise noted.

§ 745.220 Scope and applicability.

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

(b) This subpart applies to all individuals and firms who are engaged in lead-based paint activities as defined in § 745.223, except persons who perform these activities within residential dwellings that they own, unless the residential dwelling is occupied by a person or persons other than the owner or the owner's

immediate family while these activities are being performed, or a child residing in the building has been identified as having an elevated blood lead level. This subpart applies only in those States or Indian Country that do not have an authorized State or Tribal program pursuant to § 745.324 of subpart Q.

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

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

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

§ 745.223 Definitions.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Clearance levels are values that indicate the amount of lead in dust on a surface following completion of an abatement activity. To achieve clearance when dust sampling is required, values below these levels must be achieved.

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

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

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

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

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

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

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

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

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

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

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

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

Encapsulation means the application of an encapsulant.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Residential dwelling means

(1) a detached single family dwelling unit, including attached structures such as porches and stoops; or

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

Risk assessment means

(1) an on-site investigation to determine the existence, nature, severity, and location of lead-based paint hazards, and

(2) the provision of a report by the individual or the firm conducting the risk assessment, explaining the results of the investigation and options for reducing lead-based paint hazards.

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

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

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

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

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

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

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

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

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

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

[61 FR 45813, Aug. 29, 1996, as amended at 64 FR 31097, June 9, 1999; 66 FR 1239, Jan. 5, 2001; 69 FR 18495, Apr. 8, 2004; 86 FR 994, Jan. 7, 2021]

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

(a) ***Scope.***

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

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

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

(4) Accredited training programs, training program managers, and principal instructors must comply with all of the requirements of this section including approved terms of the application and all of the requirements and limitations specified in any accreditation documents issued to training programs.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(iii) Dates of course completion/test passage.

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

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

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

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

(viii) For renovator course completion certificates, the expiration date of certification.

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

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

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

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

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

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

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

(i) The training manager must provide EPA with notification of all renovator, dust sampling technician, or lead-based paint activities courses offered except for any renovator course without hands-on training delivered via electronic learning. The original notification must be received by EPA at least 7 business days prior to the start date of any renovator, dust sampling technician, or lead-based paint activities course.

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

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

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

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

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

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

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

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

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

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

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

(F) Principal instructor's name.

(G) Training manager's name and signature.

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

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

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

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

(i) The training manager must provide EPA notification after the completion of any renovator, dust sampling, or lead-based paint activities course. This notification must be received by EPA no later than 10 business days following course completion. Notifications for any e-learning renovator refresher course that does not include hands-on training must be submitted via the Central Data Exchange no later than the 10th day of the month and include all students trained in the previous month.

(ii) The notification must include the following:

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

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

(C) Date(s) of training.

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

(1) Name.

(2) Address.

(3) Date of birth.

(4) Course completion certificate number.

(5) Course test score.

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

(7) For renovator refresher courses, the expiration date of certification.

(E) Training manager's name and signature.

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

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

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

(i) Role and responsibilities of an inspector.

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

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

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

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

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

(vii) Preparation of the final inspection report.

(viii) Recordkeeping.

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

(i) Role and responsibilities of a risk assessor.

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

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

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

(v) Lead hazard screen protocol.

(vi) Sampling for other sources of lead exposure.

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

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

(ix) Preparation of a final risk assessment report.

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

(i) Role and responsibilities of a supervisor.

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

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

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

(v) Risk assessment and inspection report interpretation.

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

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

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

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

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

(xi) Clearance standards and testing.

(xii) Cleanup and waste disposal.

(xiii) Recordkeeping.

(4) ***Project designer.***

(i) Role and responsibilities of a project designer.

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

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

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

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

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

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

(i) Role and responsibilities of an abatement worker.

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

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

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

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

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

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

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

(i) Role and responsibility of a renovator.

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

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

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

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

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

(vii) Interior and exterior containment and cleanup methods.

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

(ix) Waste handling and disposal.

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

(xi) Record preparation.

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

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

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

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

(iv) Dust sampling methodologies.

(v) Clearance standards and testing.

(vi) Report preparation.

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

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

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

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

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

(2) Refresher courses for inspector, risk assessor, supervisor, and abatement worker must last a minimum of 8 training hours. Refresher courses for project designer, renovator, and dust sampling technician must last a minimum of 4 training hours. Refresher courses for all disciplines except renovator and project designer must include a hands-on component. Renovators must take a refresher course that includes hands-on training at least every other recertification.

(3) Except for renovator and project designer courses, for all other courses offered, the training program shall conduct a hands-on assessment. With the exception of project designer courses, the training program shall conduct a course test at the completion of the course. Renovators must take a refresher course that includes hands-on training at least every other recertification.

(4) A training program may apply for accreditation of a refresher course concurrently with its application for accreditation of the corresponding training course as described in paragraph (b) of this section. If so, EPA shall use the approval procedure described in paragraph (b) of this section. In addition, the minimum requirements contained in paragraphs (c)(1) through (5), (c)(6)(viii) and (c)(7) through (14), and (e)(1) through (3) of this section shall also apply.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(viii) The requirements in paragraphs (c)(1) through (5), (c)(6)(viii) and (c)(7) through (14) of this section apply to refresher training providers.

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

(f) ***Re-accreditation of training programs.***

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

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

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

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

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

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

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

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

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

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

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

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

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

(g) ***Suspension, revocation, and modification of accredited training programs.***

(1) EPA may, after notice and an opportunity for hearing, suspend, revoke, or modify training program accreditation, including refresher training accreditation, if a training program, training manager, or other person with supervisory authority over the training program has:

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

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

(iii) Failed to maintain required records.

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

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

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

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

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

(h) ***Procedures for suspension, revocation or modification of training program accreditation.***

(1) Prior to taking action to suspend, revoke, or modify the accreditation of a training program, EPA shall notify the affected entity in writing of the following:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(i) ***Training program recordkeeping requirements.***

(1) Accredited training programs shall maintain, and make available to EPA, upon request, the following records:

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

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

(iii) The course test blueprint.

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

(A) Who conducts the assessment.

(B) How the skills are graded.

(C) What facilities are used.

(D) The pass/fail rate.

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

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

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

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

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

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

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

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

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

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

(j) ***Amendment of accreditation.***

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

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

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

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

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

[76 FR 47939, Aug. 5, 2011, as amended at 81 FR 7995, Feb. 17, 2016]

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

(a) ***Certification of individuals.***

(1) Individuals seeking certification by EPA to engage in lead-based paint activities must either:

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

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

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

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

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

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

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

(b) ***Inspector, risk assessor or supervisor.***

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

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

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

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

(A) Inspectors.

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

(*2*) [Reserved]

(B) Risk assessors.

(*1*) Successful completion of an accredited training course for inspectors; and

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

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

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

(C) Supervisor:

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

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

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

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

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

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

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

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

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

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

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

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

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

(c) ***Abatement worker and project designer.***

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

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

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

(A) Abatement workers.

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

(*2*) [Reserved]

(B) Project designers.

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

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

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

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

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

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

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

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

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

(d) ***Certification based on prior training.***

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

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

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

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

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

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

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

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

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

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

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

(e) ***Re-certification.***

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

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

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

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

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

(f) ***Certification of firms.***

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

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

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

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

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

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

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

(g) ***Suspension, revocation, and modification of certifications of individuals engaged in lead-based paint activities.***

(1) EPA may, after notice and opportunity for hearing, suspend, revoke, or modify an individual's certification if an individual has:

(i) Obtained training documentation through fraudulent means.

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

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

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

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

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

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

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

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

(h) ***Suspension, revocation, and modification of certifications of firms engaged in lead-based paint activities.***

(1) EPA may, after notice and opportunity for hearing, suspend, revoke, or modify a firm's certification if a firm has:

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

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

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

(iv) Failed to maintain required records.

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

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

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

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

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

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

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

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

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

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

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

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

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

(3) The Presiding Officer shall:

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

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

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

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

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

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

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

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

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

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

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

(a) ***Effective date, applicability, and terms.***

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

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

(3) Documented methodologies that are appropriate for this section are found in the following: The U.S. Department of Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing; the EPA Guidance on Residential Lead-Based Paint, Lead-Contaminated Dust, and Lead-Contaminated Soil; the EPA Residential Sampling for Lead: Protocols

for Dust and Soil Sampling (EPA report number 7474-R-95-001); Regulations, guidance, methods or protocols issued by States and Indian Tribes that have been authorized by EPA; and other equivalent methods and quidelines.

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

(b) ***Inspection.***

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

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

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

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

(3) Paint shall be sampled in the following manner:

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

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

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

(i) Date of each inspection.

(ii) Address of building.

(iii) Date of construction.

(iv) Apartment numbers (if applicable).

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

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

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

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

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

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

(c) ***Lead hazard screen.***

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

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

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

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

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

(B) Locate at least two dust sampling locations.

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

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

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

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

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

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

(4) Paint shall be sampled in the following manner:

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

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

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

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

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

(d) ***Risk assessment.***

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

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

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

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

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

(ii) All other surfaces with visibly deteriorated paint.

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

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

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

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

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

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

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

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

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

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

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

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

(i) Date of assessment.

(ii) Address of each building.

(iii) Date of construction of buildings.

(iv) Apartment number (if applicable).

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

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

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

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

(ix) Results of the visual inspection.

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

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

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

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

(xiv) Any other sampling results.

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

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

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

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

(e) ***Abatement.***

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(F) Property name (if applicable).

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

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

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

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

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

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

(vii) Notification must be accomplished using any of the following methods: Written notification, or electronically using the Agency's Central Data Exchange (CDX). Written notification can be accomplished using either the sample form titled "Notification of Lead-Based Paint Abatement Activities" or similar form containing the information required in paragraph (e)(4)(vi) of this section. All written notifications must be delivered by U.S. Postal Service, fax, commercial delivery service, or hand delivery (persons submitting notification by U.S. Postal Service are reminded that they should allow 3 additional business days for delivery in order to ensure that EPA receives the notification by the required date). Instructions and sample forms can be obtained from the NLIC at 1-800-424-LEAD(5323), or on the Internet at *http://www.epa.gov/lead*.

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

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

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

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

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

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

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

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

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

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

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

(i) If the soil is removed:

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

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

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

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

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

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

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

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

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

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

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

room, hallway or stairwell selected. If there are less than four rooms, hallways or stairwells within the residential dwelling or child-occupied facility then all rooms, hallways or stairwells shall be sampled.

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

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

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

(viii) The clearance levels for lead in dust are 10 μg/ft^2 for floors, 100 μg/ft^2 for interior window sills, and 400 μg/ft^2 for window troughs.

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

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

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

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

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

(i) Start and completion dates of abatement.

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

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

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

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

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

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

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

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

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

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

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

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

(h) ***Determinations.***

(1) Lead-based paint is present:

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

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

(2) A paint-lead hazard is present:

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

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

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

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

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

(i) In a residential dwelling on floors and interior window sills when the weighted arithmetic mean lead loading for all single surface or composite samples of floors and interior window sills are equal to or greater than 10 μg/ft^2 for floors and 100 μg/ft^2 for interior window sills, respectively;

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

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

(4) A soil-lead hazard is present:

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

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

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

[61 FR 45813, Aug. 29, 1996, as amended at 64 FR 42852, Aug. 6, 1999; 66 FR 1239, Jan. 5, 2001; 69 FR 18496, Apr. 8, 2004; 84 FR 32648, July 9, 2019; 86 FR 994, Jan. 7, 2021]

§ 745.228 Accreditation of training programs: public and commercial buildings, bridges and superstructures. [Reserved]

§ 745.229 Certification of individuals and firms engaged in lead-based paint activities: public and commercial buildings, bridges and superstructures. [Reserved]

§ 745.230 Work practice standards for conducting lead-based paint activities: public and commercial buildings, bridges and superstructures. [Reserved]

§ 745.233 Lead-based paint activities requirements.

Lead-based paint activities, as defined in this part, shall only be conducted according to the procedures and work practice standards contained in § 745.227 of this subpart. No individual or firm may offer to perform or perform any lead-based paint activity as defined in this part, unless certified to perform that activity according to the procedures in § 745.226.

§ 745.235 Enforcement.

(a) Failure or refusal to comply with any requirement of § 745.225, § 745.226, § 745.227, or § 745.233 is a prohibited act under sections 15 and 409 of TSCA (15 U.S.C. 2614, 2689).

(b) Failure or refusal to establish, maintain, provide, copy, or permit access to records or reports as required by § 745.225, § 745.226, or § 745.227 is a prohibited act under sections 15 and 409 of TSCA (15 U.S.C. 2614, 2689).

(c) Failure or refusal to permit entry or inspection as required by § 745.237 and section 11 of TSCA (15 U.S.C. 2610) is a prohibited act under sections 15 and 409 of TSCA (15 U.S.C. 2614, 2689).

(d) In addition to the above, any individual or firm that performs any of the following acts shall be deemed to have committed a prohibited act under sections 15 and 409 of TSCA (15 U.S.C. 2614, 2689). These include the following:

(i) Obtaining certification through fraudulent representation;

(ii) Failing to obtain certification from EPA and performing work requiring certification at a job site; or

(iii) Fraudulently obtaining certification and engaging in any lead-based paint activities requiring certification.

(e) Violators are subject to civil and criminal sanctions pursuant to section 16 of TSCA (15 U.S.C. 2615) for each violation.

§ 745.237 Inspections.

EPA may conduct reasonable inspections pursuant to the provisions of section 11 of TSCA (15 U.S.C. 2610) to ensure compliance with this subpart.

§ 745.238 Fees for accreditation and certification of lead-based paint activities.

(a) ***Purpose.*** To establish and impose fees for certified individuals and firms engaged in lead-based paint activities and persons operating accredited training programs under section 402(a) of the Toxic Substances Control Act (TSCA).

(b) ***Persons who must pay fees.*** Fees in accordance with paragraph (c) of this section must be paid by:

(1) ***Training programs.***

(i) All non-exempt training programs applying to EPA for the accreditation and re-accreditation of training programs in one or more of the following disciplines: inspector, risk assessor, supervisor, project designer, abatement worker.

(ii) ***Exemptions.*** No fee shall be imposed on any training program operated by a State, federally recognized Indian Tribe, local government, or nonprofit organization. This exemption does not apply to the certification of firms or individuals.

(2) ***Firms and individuals.*** All firms and individuals seeking certification and re-certification from EPA to engage in lead-based paint activities in one or more of the following disciplines: inspector, risk assessor, supervisor, project designer, abatement worker.

(c) ***Fee amounts*** -

(1) ***Certification and accreditation fees.*** Initial and renewal certification and accreditation fees are specified in the following table:

Training Program	Accreditation	Re-accreditation (every 4 years, see 40 CFR 745.225(f)(1) for details)
Initial Course		
Inspector	$870	$620
Risk assessor	$870	$620
Supervisor	$870	$620

Training Program	Accreditation	Re-accreditation (every 4 years, see 40 CFR 745.225(f)(1) for details)
Worker	$870	$620
Project Designer	$870	$620
Refresher Course		
Inspector	$690	$580
Risk assessor	$690	$580
Supervisor	$690	$580
Worker	$690	$580
Project Designer	$690	$580
Lead-based Paint Activities - Individual	Certification	Re-certification (every 3 years, see 40 CFR 745.226(e)(1) for details)
Inspector	$410	$410
Risk assessor	$410	$410
Supervisor	$410	$410
Worker	$310	$310
Project designer	$410	$410
Tribal certification (each discipline)	$10	$10
Lead-based Paint Activities - Firm	Certification	Re-certification (every 3 years, see 40 CFR 745.226(f)(7) for details)
Firm	$550	$550
Combined Renovation and Lead-based Paint Activities Firm Application	$550	$550
Combined Renovation and Lead-based Paint Activities Tribal Firm Application	$20	$20
Tribal Firm	$20	$20

(2) ***Certification examination fee.*** Individuals required to take a certification exam in accordance with § 745.226 will be assessed a fee of $70 for each exam attempt.

(3) ***Lost identification card or certificate.*** A $15 fee shall be charged for replacement of an identification card or certificate. (See replacement procedure in paragraph (e) of this section.)

(4) ***Accreditation amendment fees.*** No fee will be charged for accreditation amendments.

(d) ***Application/payment procedure*** -

(1) ***Certification and re-certification*** -

(i) ***Individuals.*** Submit a completed application (titled "Application for Individuals to Conduct Lead-based Paint Activities"), the materials described at § 745.226, and the application fee(s) described in paragraph (c) of this section.

(ii) ***Firms.*** Submit a completed application (titled "Application for Firms "), the materials described at § 745.226, and the application fee(s) described in paragraph (c) of this section.

(2) ***Accreditation and re-accreditation.*** Submit a completed application (titled "Accreditation Application for Training Programs"), the materials described at § 745.225, and the application fee described in paragraph (c) of this section.

(3) ***Application forms.*** Application forms and instructions can be obtained from the National Lead Information Center at: 1-800-424-LEAD.

(e) ***Identification card replacement and certificate replacement.***

(1) Parties seeking identification card or certificate replacement shall complete the applicable portions of the appropriate application in accordance with the instructions provided. The appropriate applications are:

(i) ***Individuals.*** "Application for Individuals to Conduct Lead-based Paint Activities."

(ii) ***Firms.*** "Application for Firms."

(iii) ***Training programs.*** "Accreditation Application for Training Programs."

(2) Submit application and payment in the amount specified in paragraph (c)(3) of this section in accordance with the instructions provided with the application package.

(f) ***Adjustment of fees.***

(1) EPA will collect fees reflecting the costs associated with the administration and enforcement of subpart L of this part with the exception of costs associated with the accreditation of training programs operated by a State, federally recognized Indian Tribe, local government, and nonprofit organization. In order to do this, EPA will periodically adjust the fees to reflect changed economic conditions.

(2) The fees will be evaluated based on the cost to administer and enforce the program, and the number of applicants. New fee schedules will be published in the FEDERAL REGISTER.

(g) ***Failure to remit a fee.***

(1) EPA will not provide certification, re-certification, accreditation, or re-accreditation for any individual, firm, or training program which does not remit fees described in paragraph (c) of this section in accordance with the procedures specified in paragraph (d) of this section.

(2) EPA will not replace identification cards or certificates for any individual, firm, or training program which does not remit fees described in paragraph (c) of this section in accordance with the procedures specified in paragraph (e) of this section.

[64 FR 31098, June 9, 1999, as amended at 74 FR 11870, Mar. 20, 2009; 76 FR 47945, Aug. 5, 2011; 81 FR 7996, Feb. 17, 2016]

§ 745.239 Effective dates.

This subpart L shall apply in any State or Indian Country that does not have an authorized program under subpart Q, effective August 31, 1998. In such States or Indian Country:

(a) Training programs shall not provide, offer or claim to provide training or refresher training for certification without accreditation from EPA pursuant to § 745.225 on or after March 1, 1999.

(b) No individual or firm shall perform, offer, or claim to perform lead-based paint activities, as defined in this subpart, without certification from EPA to conduct such activities pursuant to § 745.226 on or after March 1, 2000.

(c) All lead-based paint activities shall be performed pursuant to the work practice standards contained in § 745.227 on or after March 1, 2000.

[61 FR 45813, Aug. 29, 1996, as amended at 64 FR 42852, Aug. 6, 1999]

Subparts M-P [Reserved]

Subpart Q - State and Indian Tribal Programs

Source: 61 FR 45825, Aug. 29, 1996, unless otherwise noted.

§ 745.320 Scope and purpose.

(a) This subpart establishes the requirements that State or Tribal programs must meet for authorization by the Administrator to administer and enforce the standards, regulations, or other requirements established under TSCA section 402 and/or section 406 and establishes the procedures EPA will follow in approving, revising, and withdrawing approval of State or Tribal programs.

(b) For State or Tribal lead-based paint training and certification programs, a State or Indian Tribe may seek authorization to administer and enforce §§ 745.225, 745.226, and 745.227. The provisions of §§ 745.220, 745.223, 745.233, 745.235, 745.237, and 745.239 shall be applicable for the purposes of such program authorization.

(c) A State or Indian Tribe may seek authorization to administer and enforce all of the provisions of subpart E of this part, just the pre-renovation education provisions of subpart E of this part, or just the training, certification, accreditation, and work practice provisions of subpart E of this part. The provisions of §§ 745.324 and 745.326 apply for the purposes of such program authorizations.

(d) A State or Indian Tribe applying for program authorization may seek either interim approval or final approval of the compliance and enforcement portion of the State or Tribal lead-based paint program pursuant to the procedures at § 745.327(a).

(e) State or Tribal submissions for program authorization shall comply with the procedures set out in this subpart.

(f) Any State or Tribal program approved by the Administrator under this subpart shall at all times comply with the requirements of this subpart.

(g) In many cases States will lack authority to regulate activities in Indian Country. This lack of authority does not impair a State's ability to obtain full program authorization in accordance with this subpart. EPA will administer the program in Indian Country if neither the State nor Indian Tribe has been granted program authorization by EPA.

[61 FR 45825, Aug. 29, 1996, as amended at 73 FR 21767, Apr. 22, 2008]

§ 745.323 Definitions.

The definitions in subpart A apply to this subpart. In addition, the definitions in § 745.223 and the following definitions apply:

Indian Country means

(1) all land within the limits of any American Indian reservation under the jurisdiction of the U.S. government, notwithstanding the issuance of any patent, and including rights-of-way running throughout the reservation;

(2) all dependent Indian communities within the borders of the United States whether within the original or subsequently acquired territory thereof, and whether within or outside the limits of a State; and

(3) all Indian allotments, the Indian titles which have not been extinguished, including rights-of-way running through the same.

Indian Tribe means any Indian Tribe, band, nation, or community recognized by the Secretary of the Interior and exercising substantial governmental duties and powers.

§ 745.324 Authorization of State or Tribal programs.

(a) ***Application content and procedures.***

(1) Any State or Indian Tribe that seeks authorization from EPA to administer and enforce the provisions of subpart E or subpart L of this part must submit an application to the Administrator in accordance with this paragraph.

(2) Before developing an application for authorization, a State or Indian Tribe shall disseminate a public notice of intent to seek such authorization and provide an opportunity for a public hearing.

(3) A State or Tribal application shall include:

(i) A transmittal letter from the State Governor or Tribal Chairperson (or equivalent official) requesting program approval.

(ii) A summary of the State or Tribal program. This summary will be used to provide notice to residents of the State or Tribe.

(iii) A description of the State or Tribal program in accordance with paragraph (b) of this section.

(iv) An Attorney General's or Tribal Counsel's (or equivalent) statement in accordance with paragraph (c) of this section.

(v) Copies of all applicable State or Tribal statutes, regulations, standards, and other materials that provide the State or Indian Tribe with the authority to administer and enforce a lead-based paint program.

(4) After submitting an application, the Agency will publish a FEDERAL REGISTER notice that contains an announcement of the receipt of the State or Tribal application, the summary of the program as provided by the State or Tribe, and a request for public comments to be mailed to the appropriate EPA Regional Office. This comment period shall last for no less than 45 days. EPA will consider these comments during its review of the State or Tribal application.

(5) Within 60 days of submission of a State or Tribal application, EPA will, if requested, conduct a public hearing in each State or Indian Country seeking program authorization and will consider all comments submitted at that hearing during the review of the State or Tribal application.

(b) ***Program description.*** A State or Indian Tribe seeking to administer and enforce a program under this subpart must submit a description of the program. The description of the State or Tribal program must include:

(1)

(i) The name of the State or Tribal agency that is or will be responsible for administering and enforcing the program, the name of the official in that agency designated as the point of contact with EPA, and addresses and phone numbers where this official can be contacted.

(ii) Where more than one agency is or will be responsible for administering and enforcing the program, the State or Indian Tribe must designate a primary agency to oversee and coordinate administration and enforcement of the program and serve as the primary contact with EPA.

(iii) In the event that more than one agency is or will be responsible for administering and enforcing the program, the application must also include a description of the functions to be performed by each agency. The desciption shall explain and how the program will be coordinated by the primary agency to ensure consistency and effective administration of the within the State or Indian Tribe.

(2) To demonstrate that the State or Tribal program is at least as protective as the Federal program, fulfilling the criteria in paragraph (e)(2)(i) of this section, the State or Tribal application must include:

(i) A description of the program that demonstrates that the program contains all of the elements specified in § 745.325, § 745.326, or both; and

(ii) An analysis of the State or Tribal program that compares the program to the Federal program in subpart E or subpart L of this part, or both. This analysis must demonstrate how the program is, in the State's or Indian Tribe's assessment, at least as protective as the elements in the Federal program at subpart E or subpart L of this part, or both. EPA will use this analysis to evaluate the protectiveness of the State or Tribal program in making its determination pursuant to paragraph (e)(2)(i) of this section.

(3) To demonstrate that the State or Tribal program provides adequate enforcement, fulfilling the criteria in paragraph (e)(2)(ii) of this section, the State or Tribal application must include a description of the State or Tribal lead-based paint compliance and enforcement program that demonstrates that the program contains all of the elements specified at § 745.327. This description shall include copies of all policies, certifications, plans, reports, and other materials that demonstrate that the State or Tribal program contains all of the elements specified at § 745.327.

(4)

(i) The program description for an Indian Tribe shall also include a map, legal description, or other information sufficient to identify the geographical extent of the territory over which the Indian Tribe exercises jurisdiction.

(ii) The program description for an Indian Tribe shall also include a demonstration that the Indian Tribe:

(A) Is recognized by the Secretary of the Interior.

(B) has an existing government exercising substantial governmental duties and powers.

(C) has adequate civil regulatory jurisdiction (as shown in the Tribal legal certification in paragraph (c)(2) of this section) over the subject matter and entities regulated.

(D) is reasonably expected to be capable of administering the Federal program for which it is seeking authorization.

(iii) If the Administrator has previously determined that an Indian Tribe has met the prerequisites in paragraphs (b)(4)(ii)(A) and (B) of this section for another EPA program, the Indian Tribe need provide only that information unique to the lead-based paint program required by paragraphs (b)(4)(ii)(C) and (D) of this section.

(c) ***Attorney General's statement.***

(1) A State or Indian Tribe must submit a written statement signed by the Attorney General or Tribal Counsel (or equivalent) certifying that the laws and regulations of the State or Indian Tribe provide adequate legal authority to administer and enforce the State or Tribal program. This statement shall include citations to the specific statutes and regulations providing that legal authority.

(2) The Tribal legal certification (the equivalent to the Attorney General's statement) may also be submitted and signed by an independent attorney retained by the Indian Tribe for representation in matters before EPA or the courts pertaining to the Indian Tribe's program. The certification shall include an assertion that the attorney has the authority to represent the Indian Tribe with respect to the Indian Tribe's authorization application.

(3) If a State application seeks approval of its program to operate in Indian Country, the required legal certification shall include an analysis of the applicant's authority to implement its provisions in Indian Country. The applicant shall include a map delineating the area over which it seeks to operate the program.

(d) ***Program certification.***

(1) At the time of submitting an application, a State may also certify to the Administrator that the State program meets the requirements contained in paragraphs (e)(2)(i) and (e)(2)(ii) of this section.

(2) If this certification is contained in a State's application, the program shall be deemed to be authorized by EPA until such time as the Administrator disapproves the program application or withdraws the program authorization. A program shall not be deemed authorized pursuant to this subpart to the extent that jurisdiction is asserted over Indian Country, including non-member fee lands within an Indian reservation.

(3) If the application does not contain such certification, the State program will be authorized only after the Administrator authorizes the program in accordance with paragraph (e) of this section.

(4) This certification shall take the form of a letter from the Governor or the Attorney General to the Administrator. The certification shall reference the program analysis in paragraph (b)(3) of this section as the basis for concluding that the State program is at least as protective as the Federal program, and provides adequate enforcement.

(e) ***EPA approval.***

(1) EPA will fully review and consider all portions of a State or Tribal application.

(2) Within 180 days of receipt of a complete State or Tribal application, the Administrator shall either authorize the program or disapprove the application. The Administrator shall authorize the program, after notice and the opportunity for public comment and a public hearing, only if the Administrator finds that:

(i) The State or Tribal program is at least as protective of human health and the environment as the corresponding Federal program under subpart E or subpart L of this part, or both; and

(ii) The State or Tribal program provides adequate enforcement.

(3) EPA shall notify in writing the State or Indian Tribe of the Administrator's decision to authorize the State or Tribal program or disapprove the State's or Indian Tribe's application.

(4) If the State or Indian Tribe applies for authorization of State or Tribal programs under both subpart E and subpart L, EPA may, as appropriate, authorize one program and disapprove the other.

(f) ***EPA administration and enforcement.***

(1) If a State or Indian Tribe does not have an authorized program to administer and enforce subpart L of this part in effect by August 31, 1998, the Administrator shall, by such date, establish and enforce the provisions of subpart L of this part as the Federal program for that State or Indian Country.

(2) If a State or Indian Tribe does not have an authorized program to administer and enforce the pre-renovation education requirements of subpart E of this part by August 31, 1998, the Administrator will, by such date, enforce those provisions of subpart E of this part as the Federal program for that State or Indian Country. If a State or Indian Tribe does not have an authorized program to administer and enforce the training, certification and accreditation requirements and work practice standards of subpart E of this part by April 22, 2009, the Administrator will, by such date, enforce those provisions of subpart E of this part as the Federal program for that State or Indian Country.

(3) Upon authorization of a State or Tribal program, pursuant to paragraph (d) or (e) of this section, it shall be an unlawful act under sections 15 and 409 of TSCA for any person to fail or refuse to comply with any requirements of such program.

(g) ***Oversight.*** EPA shall periodically evaluate the adequacy of a State's or Indian Tribe's implementation and enforcement of its authorized programs.

(h) ***Reports.*** Beginning 12 months after the date of program authorization, the primary agency for each State or Indian Tribe that has an authorized program shall submit a written report to the EPA Regional Administrator for the Region in which the State or Indian Tribe is located. This report shall be submitted at least once every 12 months for the first 3 years after program authorization. If these reports demonstrate successful program implementation, the Agency will automatically extend the reporting interval to every 2 years. If the subsequent reports demonstrate problems with implementation, EPA will require a return to annual reporting until the reports demonstrate successful program implementation, at which time the Agency will extend the reporting interval to every 2 years. The report shall include the following information:

(1) Any significant changes in the content or administration of the State or Tribal program implemented since the previous reporting period; and

(2) All information regarding the lead-based paint enforcement and compliance activities listed at § 745.327(d) “Summary on Progress and Performance.”

(i) ***Withdrawal of authorization.***

(1) If EPA concludes that a State or Indian Tribe is not administering and enforcing an authorized program in compliance with the standards, regulations, and other requirements of sections 401 through 412 of TSCA and this subpart, the Administrator shall notify the primary agency for the State or Indian Tribe in writing and indicate EPA's intent to withdraw authorization of the program.

(2) The Notice of Intent to Withdraw shall:

(i) Identify the program aspects that EPA believes are inadequate and provide a factual basis for such findings.

(ii) Include copies of relevant documents.

(iii) Provide an opportunity for the State or Indian Tribe to respond either in writing or at a meeting with appropriate EPA officials.

(3) EPA may request that an informal conference be held between representatives of the State or Indian Tribe and EPA officials.

(4) Prior to issuance of a withdrawal, a State or Indian Tribe may request that EPA hold a public hearing. At this hearing, EPA, the State or Indian Tribe, and the public may present facts bearing on whether the State's or Indian Tribe's authorization should be withdrawn.

(5) If EPA finds that deficiencies warranting withdrawal did not exist or were corrected by the State or Indian Tribe, EPA may rescind its Notice of Intent to Withdraw authorization.

(6) Where EPA finds that deficiencies in the State or Tribal program exist that warrant withdrawal, an agreement to correct the deficiencies shall be jointly prepared by the State or Indian Tribe and EPA. The agreement shall describe the deficiencies found in the program, specify the steps the State or Indian Tribe has taken or will take to remedy the deficiencies, and establish a schedule, no longer than 180 days, for each remedial action to be initiated.

(7) If the State or Indian Tribe does not respond within 60 days of issuance of the Notice of Intent to Withdraw or an agreement is not reached within 180 days after EPA determines that a State or Indian Tribe is not in compliance with the Federal program, the Agency shall issue an order withdrawing the State's or Indian Tribe's authorization.

(8) By the date of such order, the Administrator will establish and enforce the provisions of subpart E or subpart L of this part, or both, as the Federal program for that State or Indian Country.

[61 FR 45825, Aug. 29, 1996, as amended at 73 FR 21767, Apr. 22, 2008]

§ 745.325 Lead-based paint activities: State and Tribal program requirements.

(a) ***Program elements.*** To receive authorization from EPA, a State or Tribal program must contain at least the following program elements for lead-based paint activities:

(1) Procedures and requirements for the accreditation of lead-based paint activities training programs.

(2) Procedures and requirements for the certification of individuals engaged in lead-based paint activities.

(3) Work practice standards for the conduct of lead-based paint activities.

(4) Requirements that all lead-based paint activities be conducted by appropriately certified contractors.

(5) Development of the appropriate infrastructure or government capacity to effectively carry out a State or Tribal program.

(b) ***Accreditation of training programs.*** The State or Indian Tribe must have either:

(1) Procedures and requirements for the accreditation of training programs that establish:

(i) Requirements for the accreditation of training programs, including but not limited to:

(A) Training curriculum requirements.

(B) Training hour requirements.

(C) Hands-on training requirements.

(D) Trainee competency and proficiency requirements.

(E) Requirements for training program quality control.

(ii) Procedures for the re-accreditation of training programs.

(iii) Procedures for the oversight of training programs.

(iv) Procedures for the suspension, revocation, or modification of training program accreditations; or

(2) Procedures or regulations, for the purposes of certification, for the acceptance of training offered by an accredited training provider in a State or Tribe authorized by EPA.

(c) ***Certification of individuals.*** The State or Indian Tribe must have requirements for the certification of individuals that:

(1) Ensure that certified individuals:

(i) Are trained by an accredited training program; and

(ii) Possess appropriate education or experience qualifications for certification.

(2) Establish procedures for re-certification.

(3) Require the conduct of lead-based paint activities in accordance with work practice standards established by the State or Indian Tribe.

(4) Establish procedures for the suspension, revocation, or modification of certifications.

(5) Establish requirements and procedures for the administration of a third-party certification exam.

(d) ***Work practice standards for the conduct of lead-based paint activities.*** The State or Indian Tribe must have requirements or standards that ensure that lead-based paint activities are conducted reliably, effectively, and safely. At a minimum the State's or Indian Tribe's work practice standards for conducting inspections, risk assessments, and abatements must contain the requirements specified in paragraphs (d)(1), (d)(2), and (d)(3) of this section.

(1) The work practice standards for the inspection for the presence of lead-based paint must require that:

(i) Inspections are conducted only by individuals certified by the appropriate State or Tribal authority to conduct inspections.

(ii) Inspections are conducted in a way that identifies the presence of lead-based paint on painted surfaces within the interior or on the exterior of a residential dwelling or child-occupied facility.

(iii) Inspections are conducted in a way that uses documented methodologies that incorporate adequate quality control procedures.

(iv) A report is developed that clearly documents the results of the inspection.

(v) Records are retained by the certified inspector or the firm.

(2) The work practice standards for risk assessment must require that:

(i) Risk assessments are conducted only by individuals certified by the appropriate State or Tribal authority to conduct risk assessments.

(ii) Risk assessments are conducted in a way that identifies and reports the presence of lead-based paint hazards.

(iii) Risk assessments consist of, at least:

(A) An assessment, including a visual inspection, of the physical characteristics of the residential dwelling or child-occupied facility;

(B) Environmental sampling for lead in paint, dust, and soil;

(C) Environmental sampling requirements for lead in paint, dust, and soil that allow for comparison to the standards for lead-based paint hazards established or revised by the State or Indian Tribe pursuant to paragraph (e) of this section; and

(D) A determination of the presence of lead-based paint hazards made by comparing the results of visual inspection and environmental sampling to the standards for lead-based paint hazards established or revised by the State or Indian Tribe pursuant to paragraph (e) of this section.

(iv) The program elements required in paragraph (d)(2)(iii)(C) and (d)(2)(iii)(D) of this section shall be adopted in accordance with the schedule for the demonstration required in paragraph (e) of this section.

(v) The risk assessor develops a report that clearly presents the results of the assessment and recommendations for the control or elimination of all identified hazards.

(vi) The certified risk assessor or the firm retains the appropriate records.

(3) The work practice standards for abatement must require that:

(i) Abatements are conducted only by individuals certified by the appropriate State or Tribal authority to conduct or supervise abatements.

(ii) Abatements permanently eliminate lead-based paint hazards and are conducted in a way that does not increase the hazards of lead-based paint to the occupants of the dwelling or child-occupied facility.

(iii) Abatements include post-abatement lead in dust clearance sampling and conformance with clearance levels established or adopted by the State or Indian Tribe.

(iv) The abatement contractor develops a report that describes areas of the residential dwelling or child-occupied facility abated and the techniques employed.

(v) The certified abatement contractor or the firm retains appropriate records.

(e) ***Revisions to lead-based paint activities program requirements.*** When EPA publishes in the FEDERAL REGISTER revisions to the lead-based paint activities program requirements contained in subpart L of this part:

(1) A State or Tribe with a lead-based paint activities program approved before the effective date of the revisions to the lead-based paint activities program requirements in subpart L of this part must demonstrate that it meets the requirements of this section in a report that it submits pursuant to § 745.324(h) but no later than two years after the effective date of the revisions.

(2) A State or Tribe with an application for approval of a lead-based paint activities program submitted but not approved before the effective date of the revisions to the lead-based paint activities program requirements in subpart L of this part must demonstrate that it meets the requirements of this section either by amending its application or in a report that it submits pursuant to § 745.324(h) but no later than two years after the effective date of the revisions.

(3) A State or Tribe submitting its application for approval of a lead-based paint activities program on or after the effective date of the revisions must demonstrate in its application that it meets the requirements of the new lead-based paint activities program requirements in subpart L of this part.

[61 FR 45825, Aug. 29, 1996, as amended at 66 FR 1240, Jan. 5, 2001; 84 FR 32648, July 9, 2019]

§ 745.326 Renovation: State and Tribal program requirements.

(a) ***Program elements.*** To receive authorization from EPA, a State or Tribal program must contain the following program elements:

(1) For pre-renovation education programs, procedures and requirements for the distribution of lead hazard information to owners and occupants of target housing and child-occupied facilities before renovations for compensation.

(2) For renovation training, certification, accreditation, and work practice standards programs:

(i) Procedures and requirements for the accreditation of renovation and dust sampling technician training programs. A State and Tribal program is not required to include procedures and requirements for the dust sampling technician training discipline if the State or Tribal program requires dust sampling to be performed by a certified lead-based paint inspector or risk assessor.

(ii) Procedures and requirements for accredited initial and refresher training for renovators and dust sampling technicians and on-the-job training for other individuals who perform renovations.

(iii) Procedures and requirements for the certification of individuals and/or firms.

(iv) Requirements that all renovations be conducted by appropriately certified individuals and/or firms.

(v) Work practice standards for the conduct of renovations.

(3) For all renovation programs, development of the appropriate infrastructure or government capacity to effectively carry out a State or Tribal program.

(b) ***Pre-renovation education.*** To be considered at least as protective as the Federal program, the State or Tribal program must:

(1) Establish clear standards for identifying renovation activities that trigger the information distribution requirements.

(2) Establish procedures for distributing the lead hazard information to owners and occupants of housing and child-occupied facilities prior to renovation activities.

(3) Require that the information to be distributed include either the pamphlet titled *Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools,* developed by EPA under section 406(a) of TSCA, or an alternate pamphlet or package of lead hazard information that

has been submitted by the State or Tribe, reviewed by EPA, and approved by EPA for that State or Tribe. Such information must contain renovation-specific information similar to that in *Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools,* must meet the content requirements prescribed by section 406(a) of TSCA, and must be in a format that is readable to the diverse audience of housing and child-occupied facility owners and occupants in that State or Tribe.

(i) A State or Tribe with a pre-renovation education program approved before June 23, 2008, must demonstrate that it meets the requirements of this section no later than the first report that it submits pursuant to § 745.324(h) on or after April 22, 2009.

(ii) A State or Tribe with an application for approval of a pre-renovation education program submitted but not approved before June 23, 2008, must demonstrate that it meets the requirements of this section either by amending its application or in the first report that it submits pursuant to § 745.324(h) of this part on or after April 22, 2009.

(iii) A State or Indian Tribe submitting its application for approval of a pre-renovation education program on or after June 23, 2008, must demonstrate in its application that it meets the requirements of this section.

(c) ***Accreditation of training programs.*** To be considered at least as protective as the Federal program, the State or Tribal program must meet the requirements of either paragraph (c)(1) or (c)(2) of this section:

(1) The State or Tribal program must establish accreditation procedures and requirements, including:

(i) Procedures and requirements for the accreditation of training programs, including, but not limited to:

(A) Training curriculum requirements.

(B) Training hour requirements.

(C) Hands-on training requirements.

(D) Trainee competency and proficiency requirements.

(E) Requirements for training program quality control.

(ii) Procedures and requirements for the re-accreditation of training programs.

(iii) Procedures for the oversight of training programs.

(iv) Procedures and standards for the suspension, revocation, or modification of training program accreditations; or

(2) The State or Tribal program must establish procedures and requirements for the acceptance of renovation training offered by training providers accredited by EPA or a State or Tribal program authorized by EPA under this subpart.

(d) ***Certification of individuals and/or renovation firms.*** To be considered at least as protective as the Federal program, the State or Tribal program must:

(1) Establish procedures and requirements that ensure that individuals who perform or direct renovations are properly trained. These procedures and requirements must include:

(i) A requirement that renovations be performed and directed by at least one individual who has been trained by an accredited training program.

(ii) Procedures and requirements for accredited refresher training for these individuals.

(iii) Procedures and requirements for individuals who have received accredited training to provide on-the-job training for those individuals who perform renovations but do not receive accredited training. A State and Tribal program is not required to include procedures and requirements for on-the-job training for renovation workers if the State or Tribal program requires accredited initial and refresher training for all persons who perform renovations.

(2) Establish procedures and requirements for the formal certification and re-certification of renovation firms.

(3) Establish procedures for the suspension, revocation, or modification of certifications.

(e) ***Work practice standards for renovations.*** To be considered at least as protective as the Federal program, the State or Tribal program must establish standards that ensure that renovations are conducted reliably, effectively, and safely. At a minimum, the State or Tribal program must contain the following requirements:

(1) Renovations must be conducted only by certified renovation firms, using trained individuals.

(2) Renovations are conducted using lead-safe work practices that are at least as protective to occupants as the requirements in § 745.85.

(3) Certified individuals and/or renovation firms must retain appropriate records.

(f) ***Revisions to renovation program requirements.*** When EPA publishes in the FEDERAL REGISTER revisions to the renovation program requirements contained in subparts E and L of this part:

(1) A State or Tribe with a renovation program approved before the effective date of the revisions to the renovation program requirements in subparts E and L of this part must demonstrate that it meets the requirements of this section no later than the first report that it submits pursuant to § 745.324(h) but no later than 2 years after the effective date of the revisions.

(2) A State or Tribe with an application for approval of a renovation program submitted but not approved before the effective date of the revisions to the renovation program requirements in subparts E and L of this part must demonstrate that it meets the requirements of this section either by amending its application or in the first report that it submits pursuant to § 745.324(h) of this part but no later than 2 years after the effective date of the revisions.

(3) A State or Tribe submitting its application for approval of a renovation program on or after the effective date of the revisions must demonstrate in its application that it meets the requirements of the new renovation program requirements in subparts E and L of this part.

[73 FR 21768, Apr. 22, 2008, as amended at 75 FR 24819, May 6, 2010; 76 FR 47945, Aug. 5, 2011]

§ 745.327 State or Indian Tribal lead-based paint compliance and enforcement programs.

(a) ***Approval of compliance and enforcement programs.*** A State or Indian Tribe seeking authorization of a lead-based paint program can apply for and receive either interim or final approval of the compliance and enforcement program portion of its lead-based paint program. Indian Tribes are not required to exercise criminal enforcement jurisdiction as a condition for program authorization.

(1) ***Interim approval.*** Interim approval of the compliance and enforcement program portion of the State or Tribal lead-based paint program may be granted by EPA only once, and subject to a specific expiration date.

(i) To be considered adequate for purposes of obtaining interim approval for the compliance and enforcement program portion of a State or Tribal lead-based paint program, a State or Indian Tribe must, in its application described at § 745.324(a):

(A) Demonstrate it has the legal authority and ability to immediately implement the elements in paragraph (b) of this section. This demonstration shall include a statement that the State or Indian Tribe, during the interim approval period, shall carry out a level of compliance monitoring and enforcement necessary to ensure that the State or Indian Tribe addresses any significant risks posed by noncompliance with lead-based paint activity requirements.

(B) Present a plan with time frames identified for implementing in the field each element in paragraph (c) of this section. All elements of paragraph (c) of this section must be fully implemented no later than 3 years from the date of EPA's interim approval of the compliance and enforcement program portion of a State or Tribal lead-based paint program. A statement of resources must be included in the State or Tribal plan which identifies what resources the State or Indian Tribe intends to devote to the administration of its lead-based paint compliance and enforcement program.

(C) Agree to submit to EPA the Summary on Progress and Performance of lead-based paint compliance and enforcement activities as described at paragraph (d) of this section.

(ii) Any interim approval granted by EPA for the compliance and enforcement program portion of a State or Tribal lead-based paint program will expire no later than 3 years from the date of EPA's interim approval. One hundred and eighty days prior to this expiration date, a State or Indian Tribe shall apply to EPA for final approval of the compliance and enforcement program portion of a State or Tribal lead-based paint program. Final approval shall be given to any State or Indian Tribe which has in place all of the elements of paragraphs (b), (c), and (d) of this section. If a State or Indian Tribe does not receive final approval for the compliance and enforcement program portion of a State or Tribal lead-based paint program by the date 3 years after the date of EPA's interim approval, the Administrator shall, by such date, initiate the process to withdraw the State or Indian Tribe's authorization pursuant to § 745.324(i).

(2) ***Final approval.*** Final approval of the compliance and enforcement program portion of a State or Tribal lead-based paint program can be granted by EPA either through the application process described at § 745.324(a), or, for States or Indian Tribes which previously received interim approval as described in paragraph (a)(1) of this section, through a separate application addressing only the compliance and enforcement program portion of a State or Tribal lead-based paint program.

(i) For the compliance and enforcement program to be considered adequate for final approval through the application described at § 745.324(a), a State or Indian Tribe must, in its application:

(A) Demonstrate it has the legal authority and ability to immediately implement the elements in paragraphs (b) and (c) of this section.

(B) Submit a statement of resources which identifies what resources the State or Indian Tribe intends to devote to the administration of its lead-based paint compliance and enforcement program.

(C) Agree to submit to EPA the Summary on Progress and Performance of lead-based paint compliance and enforcement activities as described at paragraph (d) of this section.

(ii) For States or Indian Tribes which previously received interim approval as described in paragraph (a)(1) of this section, in order for the State or Tribal compliance and enforcement program to be considered adequate for final approval through a separate application addressing only the compliance and enforcement program portion of a State or Tribal lead-based paint program, a State or Indian Tribe must, in its application:

(A) Demonstrate that it has the legal authority and ability to immediately implement the elements in paragraphs (b) and (c) of this section.

(B) Submit a statement which identifies the resources the State or Indian Tribe intends to devote to the administration of its lead-based paint compliance and enforcement program.

(C) Agree to submit to EPA the Summary on Progress and Performance of lead-based paint compliance and enforcement activities as described at paragraph (d) of this section.

(D) To the extent not previously submitted through the application described at § 745.324(a), submit copies of all applicable State or Tribal statutes, regulations, standards, and other material that provide the State or Indian Tribe with authority to administer and enforce the lead-based paint compliance and enforcement program, and copies of the policies, certifications, plans, reports, and any other documents that demonstrate that the program meets the requirements established in paragraphs (b) and (c) of this section.

(b) ***Standards, regulations, and authority.*** The standards, regulations, and authority described in paragraphs (b)(1) through (b)(4) of this section are part of the required elements for the compliance and enforcement portion of a State or Tribal lead-based paint program.

(1) ***Lead-based paint activities or renovation requirements.*** State or Tribal lead-based paint compliance and enforcement programs will be considered adequate if the State or Indian Tribe demonstrates, in its application at § 745.324(b)(2), that it has established a lead-based paint program that contains all of the elements specified in § 745.325 or § 745.326, or both, as applicable.

(2) ***Authority to enter.*** State or Tribal officials must be able to enter, through consent, warrant, or other authority, premises or facilities where lead-based paint violations may occur for purposes of conducting inspections.

(i) State or Tribal officials must be able to enter premises or facilities where those engaged in training for lead-based paint activities or renovations conduct business.

(ii) For the purposes of enforcing a renovation program, State or Tribal officials must be able to enter a firm's place of business or work site.

(iii) State or Tribal officials must have authority to take samples and review records as part of the lead-based paint inspection process.

(3) ***Flexible remedies.*** A State or Tribal lead-based paint compliance and enforcement program must provide for a diverse and flexible array of enforcement statutory and regulatory authorities and remedies. At a minimum, these authorities and remedies, which must also be reflected in an enforcement response policy, must include the following:

(i) The authority to issue warning letters, Notices of Noncompliance, Notices of Violation, or the equivalent;

(ii) The authority to assess administrative or civil fines, including a maximum penalty authority for any violation in an amount no less than $5,000 per violation per day;

(iii) The authority to assess the maximum penalties or fines for each instance of violation and, if the violation is continuous, the authority to assess penalties or fines up to the maximum amount for each day of violation, with all penalties assessed or collected being appropriate for the violation after consideration of factors as the State or Tribe determine to be relevant, including the size or viability of the business, enforcement history, risks to human health or the environment posed by the violation, and other similar factors;

(iv) The authority to commence an administrative proceeding or to sue in courts of competent jurisdiction to recover penalties;

(v) The authority to suspend, revoke, or modify the accreditation of any training provider or the certification of any individual or firm;

(vi) The authority to commence an administrative proceeding or to sue in courts of competent jurisdiction to enjoin any threatened or continuing violation of any program requirement, without the necessity of a prior suspension or revocation of a trainer's accreditation or a firm's or individual's certification;

(vii) The authority to apply criminal sanctions, including recovering fines; and

(viii) The authority to enforce its authorized program using a burden of proof standard, including the degree of knowledge or intent of the respondent that is no greater than it is for EPA under TSCA.

(4) ***Adequate resources.*** An application must include a statement that identifies the resources that will be devoted by the State or Indian Tribe to the administration of the State or Tribal lead-based paint compliance and enforcement program. This statement must address fiscal and personnel resources that will be devoted to the program.

(c) ***Performance elements.*** The performance elements described in paragraphs (c)(1) through (c)(7) of this section are part of the required elements for the compliance and enforcement program portion of a State or Tribal lead-based paint program.

(1) ***Training.*** A State or Tribal lead-based paint compliance and enforcement program must implement a process for training enforcement and inspection personnel and ensure that enforcement personnel and inspectors are well trained. Enforcement personnel must understand case development procedures and the maintenance of proper case files. Inspectors must successfully demonstrate knowledge of the requirements of the particular discipline (e.g., abatement supervisor, and/or abatement worker, and/or lead-based paint inspector, and/or risk assessor, and/or project designer) for which they have compliance monitoring and enforcement responsibilities. Inspectors must also be trained in violation discovery, methods of obtaining consent, evidence gathering, preservation of evidence and chain-of-custody, and sampling procedures. A State or Tribal lead-based paint compliance and enforcement program must also implement a process for the continuing education of enforcement and inspection personnel.

(2) ***Compliance assistance.*** A State or Tribal lead-based paint compliance and enforcement program must provide compliance assistance to the public and the regulated community to facilitate awareness and understanding of and compliance with State or Tribal requirements governing the conduct of lead-based paint activities or renovations. The type and nature of this assistance can be defined by the State or Indian Tribe to achieve this goal.

(3) ***Sampling techniques.*** A State or Tribal lead-based paint compliance and enforcement program must have the technological capability to ensure compliance with the lead-based paint program requirements. A State or Tribal application for approval of a lead-based paint program must show that the State or Indian Tribe is technologically capable of conducting a lead-based paint compliance and enforcement program. The State or Tribal program must have access to the facilities and equipment necessary to perform sampling and laboratory analysis as needed. This laboratory facility must be a recognized laboratory as defined at § 745.223, or the State or Tribal program must implement a quality assurance program that ensures appropriate quality of laboratory personnel and protects the integrity of analytical data.

(4) ***Tracking tips and complaints.*** A State or Tribal lead-based paint compliance and enforcement program must demonstrate the ability to process and react to tips and complaints or other information indicating a violation.

(5) ***Targeting inspections.*** A State or Tribal lead-based paint compliance and enforcement program must demonstrate the ability to target inspections to ensure compliance with the lead-based paint program requirements. Such targeting must include a method for obtaining and using notifications of commencement of abatement activities.

(6) ***Follow up to inspection reports.*** A State or Tribal lead-based paint compliance and enforcement program must demonstrate the ability to reasonably, and in a timely manner, process and follow-up on inspection reports and other information generated through enforcement-related activities associated with a lead-based paint program. The State or Tribal program must be in a position to ensure correction of violations and, as appropriate, effectively develop and issue enforcement remedies/responses to follow up on the identification of violations.

(7) ***Compliance monitoring and enforcement.*** A State or Tribal lead-based paint compliance and enforcement program must demonstrate, in its application for approval, that it is in a position to implement a compliance monitoring and enforcement program. Such a compliance monitoring and enforcement program must ensure correction of violations, and encompass either planned and/or responsive lead-based paint compliance inspections and development/issuance of State or Tribal enforcement responses which are appropriate to the violations.

(d) ***Summary on Progress and Performance.*** The Summary on Progress and Performance described below is part of the required elements for the compliance and enforcement program portion of a State or Tribal lead-based paint program. A State or Tribal lead-based paint compliance and enforcement program must submit to the appropriate EPA Regional Administrator a report which summarizes the results of implementing the State or Tribal lead-based paint compliance and enforcement program, including a summary of the scope of the regulated community within the State or Indian Tribe (which would include the number of individuals and firms certified in lead-based paint activities and the number of training programs accredited), the inspections conducted, enforcement actions taken, compliance assistance provided, and the level of resources committed by the State or Indian Tribe to these activities. The report shall be submitted according to the requirements at § 745.324(h).

(e) ***Memorandum of Agreement.*** An Indian Tribe that obtains program approval must establish a Memorandum of Agreement with the Regional Administrator. The Memorandum of Agreement shall be executed by the Indian Tribe's counterpart to the State Director (e.g., the Director of Tribal Environmental Office, Program or Agency). The Memorandum of Agreement must include provisions for the timely and appropriate referral to the Regional Administrator for those criminal enforcement matters where that Indian Tribe does not have the authority (e.g., those addressing criminal violations by non-Indians or violations meriting penalties over $5,000). The Agreement must also identify any enforcement agreements that may exist between the Indian Tribe and any State.

(f) ***Electronic reporting under State or Indian Tribe programs.*** States and tribes that choose to receive electronic documents under the authorized state or Indian tribe lead-based paint program, must ensure that the requirements of 40 CFR part 3 - (Electronic reporting) are satisfied in their lead-based paint program.

[61 FR 45825, Aug. 29, 1996, as amended at 70 FR 59889, Oct. 13, 2005; 73 FR 21769, Apr. 22, 2008; 76 FR 47946, Aug. 5, 2011]

§ 745.339 Effective date.

States and Indian Tribes may seek authorization to administer and enforce subpart L of this part pursuant to this subpart at any time. States and Indian Tribes may seek authorization to administer and enforce the pre-renovation education provisions of subpart E of this part pursuant to this subpart at any time. States and Indian Tribes may seek authorization to administer and enforce all of subpart E of this part pursuant to this subpart effective June 23, 2008.

[73 FR 21769, Apr. 22, 2008]

APPENDIX 6.0

CERTIFICATIONS

THIS IS TO CERTIFY THAT

MATTHEW SPEAR

HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

ASBESTOS INSPECTOR INITIAL COURSE

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date: 9/12/2022 - 9/14/2022

Course Location: Portland, OR

Certificate: IN-22-0717C

For verification of the authenticity of this certificate contact:
PBS Engineering and Environmental Inc.

PBS

CCB #SRA0614 24-Hr Training

24-Hour AHERA Inspector Training; AHERA is the Asbestos Hazard Emergency Response Act enacting Title II of Toxic Substance Control Act (TSCA)

Expiration Date: 09/14/2023

Andy Fridley

Andy Fridley, Instructor

LEAD CLASSES.COM
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Portland OR 97217
Info@LeadClasses.com

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Certificate of Attendance and Successful Completion Renovator Initial - English

Issued per OAC 333-070 and 40 CFR Part 745.225

Matthew C Spear
10480 SW Eastridge St Apt 2
Portland, OR 97225
Certificate # R-I-41R036-22-00614

Course Date:	09/16/2022
Exam Date:	09/16/2022
Expiration Date:	09/16/2027

Steven Hoff Training Manager
Crosswall Training / LeadClasses.com

9/16/2022
Date