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ELPAT Program

Background and Current Status

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Introduction

The Environmental Lead Proficiency Analytical Testing (ELPAT) Program is administered by the American Industrial Hygiene Association (AIHA), in cooperation with researchers at the Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH), and the U.S. Environmental Protection Agency (EPA), Office of Pollution Prevention and Toxics to evaluate and improve the performance of laboratories conducting analyses associated with lead abatement.[1,2] Proficiency test samples are prepared by an AIHA contractor, Research Triangle Institute (RTI), using real-world paint chips, dusts, and soils. Quarterly samples are sent to participating laboratories by RTI and the performance of the laboratories is evaluated at NIOSH with sufficient time for laboratories to obtain repeat samples and to correct analytical problems before the next round of samples is sent.

The ELPAT Program is open to *all* interested laboratories, including laboratories outside the United States, laboratories seeking accreditation by various private or state laboratory accreditation systems, and laboratories that do not intend to seek laboratory accreditation. The ELPAT Program is part of an EPA Program, the National Lead Laboratory Accreditation Program (NLLAP), to recognize private and state laboratory accreditation systems.[3] NLLAP requirements include successful participation in the ELPAT Program for EPA recognition of accreditation. Two organizations, the American Association for Laboratory Accreditation (A2LA)[4] and AIHA,[5] are recognized as accrediting organizations under NLLAP and have in place environmental lead laboratory accreditation systems. Each of these accreditation systems requires participation in ELPAT for environmental lead analysis of paint chips, dusts, and soils. Information on specific A2LA or AIHA laboratory accreditation requirements can be obtained from A2LA and AIHA at the addresses listed at the end of this column.

ELPAT Performance Evaluation

The evaluation of the individual laboratories in the ELPAT Program is based upon consensus values from reference laboratories and is modeled after the evaluation procedures currently used in an industrial hygiene proficiency testing program, the Proficiency Analytical Testing (PAT) Program. Reference laboratories are preselected to provide the performance limits for each sample. These laboratories must meet the following criteria: the laboratory was proficient in the previous PAT round for a wide variety of industrial hygiene laboratory air analyses, including airborne lead, and industrial hygiene laboratory operations must be accredited by AIHA.[6] Once a significant history of ELPAT performance is available, reference laboratories will include all participating laboratories in the ELPAT Program that have previously demonstrated proficient performance in analyzing all matrices of the ELPAT Program. Eventually, a requirement will be added that ELPAT reference laboratories must be accredited by an EPA NLLAP-recognized accrediting organization.

After data from reference laboratories are collected and extreme reference laboratory data have been statistically treated, the mean ± 3 standard deviations of the treated reference laboratory data become the acceptable performance range. Laboratory results are acceptable if they fall within the performance limits. Results falling outside the performance limits are designated as outliers. This is the same criterion used by NIOSH to establish acceptable and outlier performance of industrial hygiene laboratories in the PAT Program.[6]

Laboratories are rated based upon performance in the ELPAT Program over the last year (i.e., four rounds) for each lead matrix—paint chips, soil, and dust wipes. The laboratory is proficient for the lead matrix if the following occurs:

1. all four results have been reported and all are designated as acceptable for the last two consecutive rounds; or
2. three-fourths or more of the results reported in the last four consecutive rounds are designated as acceptable.

However, if a laboratory does not report values for the lead matrix on the round being evaluated, the laboratory is not rated.

Initial criteria for proficient performance are similar to the procedure used in the PAT Program.[6] However, the ELPAT statistical protocol and related computer programs have been designed to permit future change to harmonize these proficiency test requirements with internationally harmonized proficiency test protocols. The international protocol for consensus values from reference laboratories using z-scores has been developed and published by the Association of Official Analytical Chemists International, the International Organization for Standardization, and the International Union of Pure and Applied Chemistry.[7]

ELPAT Round 9, November 1994

Paint samples for round 9 were prepared from paint chips collected from a variety of sites, including commercial lead abatement, building renovation, and demolition sites. The chips were ground to a maximum particle size of 120 μm.

Soil samples came from driplines around older houses in North Carolina and from industrial sites in Colorado and Louisiana. Soil samples were dried and then sterilized by heating the soil to 325°F for a minimum of 2 hours, and finally sieved to a maximum particle size of 150 μm.

Round 9 dust wipes were prepared by gravimetrically loading Whatman 40 filter paper with sterilized (gamma-irradiated) household and postabatement dust, sieved to a maximum particle size of 150 μm. The loaded filters were moistened with 0.5 ml of 3 percent hydrogen peroxide solution. The blank wipe was prepared from a Whatman filter moistened with the same hydrogen peroxide solution. Whatman filters are easier to digest than other wipe media (e.g., baby wipes, hand wipes) used by many laboratories. In the future, the wipe medium may be changed from the Whatman filter to a

TABLE 1. ELPAT Program Summary Statistics of Reference Laboratories for Round 009

Sample Type	Sample	N	Mean	Minimum	Maximum	STD	RSD (%)	Acceptable Range
Paint chips (%)	1	31	0.5499	0.4443	0.5997	.049	8.9	0.4025–0.6973
	2	31	0.0481	0.0412	0.054	.004	8.8	0.0354–0.0608
	3	31	4.7702	4.2177	5.16	.293	6.1	3.8909–5.6496
	4	31	0.4245	0.361	0.4811	.035	8.3	0.3189–0.5301
Soil (mg/kg)	1	31	500.9	473.5	546.1	22.5	4.5	433.3–568.5
	2	31	957.2	882	1051.2	54.2	5.7	794.6–1119.7
	3	31	502.4	454	534.9	23.5	4.7	431.9–573
	4	31	89.5	78.5	99	6.66	7.4	69.5–109.5
Dust wipes (μg)	1	31	884.8	785.5	965	51.8	5.9	729.4–1040.2
	2	31	330.9	264.2	377.6	35.3	10.7	224.9–437
	3	31	108.4	96.1	121.5	8.12	7.5	84–132.8
	4	31	478.6	433.6	537	34.0	7.1	376.6–580.6

commercially available wipe that more closely represents field sample media, if a single sample medium is recommended by various lead methods.

A total of 356 laboratories were enrolled for round 9 of the ELPAT Program, with 333 (94%) laboratories submitting results either by paper or by the ELPAT automated data entry system. Table 1 lists summary statistics of reference laboratories for each matrix and sample number. Agreement among reference laboratories is demonstrated by relative standard deviations ranging from 6.1 to 8.9 percent for paint chips, 4.5 to 7.4 percent for soils, and 5.9 to 10.7 percent for dust wipes. This is similar to the agreement among reference laboratories on previous ELPAT rounds for each matrix.

Table 2 shows the number of all participating laboratory analyses that were identified as outliers. The percentage of outliers for all analyses was under 17.2 percent (4.6 to 10.5% for paint chips, 7.5 to 17.2% for soils, and 4.4 to 9.7% for dust wipes). This is also similar to the frequency of outliers reported on the earlier rounds of ELPAT for each matrix.

Sample digestion techniques are grouped into hotplate, microwave, and all other techniques reported by participants. Hotplate digestion categories are: NIOSH 7082/7105 (a nitric acid/hydrogen peroxide digestion method modified from NIOSH Manual of Analytical Methods Method 7082[8]), EPA SW846-3050A[9] (an EPA nitric acid/hydrogen peroxide method), and other hotplate techniques. Microwave digestion categories are: EPA SW846-3051[10] (a nitric acid digestion method), EPA AREAL[11] [a nitric/hydrochloric acid digestion method from AREAL (RTP-MRDD-037) standard operating procedure], and other microwave techniques. The "other" category includes nonmicrowave and nonhotplate techniques such as X-ray fluorescence sample preparation, leaching techniques, muffle furnace, and Parr bomb.

Instrumental methods are categorized into flame atomic absorption (FAA), graphite furnace atomic absorption (GFAA), inductively coupled plasma–atomic emission spectroscopy (ICP-AES), laboratory X-ray fluorescence (lab XRF), and "other," which includes ICP-mass spectroscopy (ICP-MS). For informational purposes, the American Society for Testing Materials (ASTM) has just released a new publication of ASTM standards on lead-based paint abatement in buildings, which includes standards for the collection, digestion, and analysis of paint, soil, and dust samples for lead determination using FAA, GFAA, and ICP-AES techniques. Information on ordering this publication can be obtained from ASTM at the address listed at the end of this column.

Table 3 shows a summary of failures (outliers) for the three lead matrices by digestion technique and analytical method used by participating laboratories. A series of Fischer's exact tests (nonparametric tests) were used to compare the various combinations of digestion techniques (hotplate and microwave) and analytical methods (FAA, GFAA, ICP-AES) for statistically significant differences in the ability of the digestion techniques/analytical method combinations to meet ELPAT performance limits.[12] To detect differences in performance, a criterion was then used where participating laboratories are classified into two groups: those that had no outliers on the four ELPAT samples of the matrix and those that had one or more outliers. Fischer's exact test was then repeated for each ELPAT matrix. No statistically sig-

TABLE 2. Summary of Performance—All Laboratories Participated for Round 009

Sample Type	Sample No.	No. of Labs Rated	Acceptable Labs	Low Outlier	High Outlier
Paint chips (%)	1	324	301	15	8
	2	324	300	10	14
	3	324	290	25	9
	4	324	309	9	6
Soil (mg/kg)	1	279	238	29	12
	2	279	258	11	10
	3	279	249	19	11
	4	279	231	22	26
Dust wipes (μg)	1	298	269	22	7
	2	298	285	9	4
	3	298	269	22	7
	4	298	278	16	4

TABLE 3. ELPAT Program Round 009—All Labs Performance Summary

			Paint Chips (%)				Soil (mg/kg)				Dust Wipes (μg)			
			Acceptable		Failures		Acceptable		Failures		Acceptable		Failures	
Method	**Sample**	**Preparation**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
FAA	Hotplate	NIOSH-7082/7105	148	88	20	12	71	89	9	11	231	92	21	8
		EPA-SW846-3050A	346	94	22	6	385	87	59	13	280	95	16	5
		Other-hotplate	111	99	1	1	44	100	0	0	51	98	1	2
	Microwave	EPA AREAL	4	100	0	0	4	100	0	0	3	75	1	25
		EPA-SW846-3051	46	96	2	4	32	89	4	11	40	100	0	0
		Other-microwave	16	100	0	0	4	100	0	0	16	100	0	0
	Other	All other	35	97	1	3	12	100	0	0	24	100	0	0
	—	—	8	100	0	0	4	100	0	0	4	100	0	0
GFAA	Hotplate	NIOSH-7082/7105	4	100	0	0	0	0	0	0	3	75	1	25
		EPA-SW846-3050A	13	81	3	19	19	95	1	5	36	100	0	0
	Microwave	EPA-SW846-3051	4	100	0	0	6	75	2	25	8	67	4	33
ICP-AES	Hotplate	NIOSH-7082/7105	52	100	0	0	25	89	3	11	72	90	8	10
		EPA-SW846-3050A	265	90	31	10	264	85	48	15	221	89	27	11
		Other-hotplate	34	94	2	6	19	95	1	5	47	98	1	2
	Microwave	EPA AREAL	12	100	0	0	8	100	0	0	8	100	0	0
		EPA-SW846-3051	45	94	3	6	49	88	7	13	29	91	3	9
		Other-microwave	19	95	1	5	8	100	0	0	14	70	6	30
	Other	All other	8	100	0	0	4	100	0	0	0	0	0	0
Lab-XRF	Hotplate	EPA-SW846-3050A	4	100	0	0	0	0	0	0	0	0	0	0
	—	—	3	38	5	63	8	100	0	0	0	0	0	0
Others	Hotplate	EPA-SW846-3050A	5	63	3	38	5	63	3	38	8	100	0	0
	Microwave	EPA-SW846-3051	3	75	1	25	4	100	0	0	3	75	1	25
		Other-microwave	11	92	1	8	0	0	0	0	0	0	0	0
—	Hotplate	Other-hotplate	4	100	0	0	0	0	0	0	0	0	0	0
	—	—	0	0	0	0	1	25	3	75	3	75	1	25
Total			1200	93	96	7	976	87	140	13	1101	92	91	8

— = Not reported.

nificant differences were detected for paint chips, soils, or dust wipes.

Inspection of Table 3 shows that the predominant analytical methods were FAA and ICP-AES. A total of 6 laboratories analyzed paint chips, 7 laboratories analyzed soils, and 13 laboratories analyzed dust wipes with GFAA. Two laboratories used ICP-MS, two used direct current plasma-AES, one used dithizone spectrophotometry, and one laboratory did not specify the instrumental method. These laboratories had only varying degrees of success in obtaining acceptable results for paint chips, soils, and dust wipes. Three laboratories used lab XRF, with two of the three laboratories unable to analyze paint chip samples. The two laboratories analyzing soil with lab XRF were successful and no outliers were identified between them.

A more complete comparison of biases and interlaboratory precision differences among digestion techniques and instrumental methods is being undertaken at NIOSH.

ELPAT Round 8 Bias Analysis

Statistical significance tests are performed for investigating differences in bias among the principal sample preparation and instrumental methods and among the combinations of these two factors. The tests are performed for each matrix (paint chips, soils, and dust wipes), and ELPAT sample (sample numbers 1, 2, 3, and 4) whenever at least three laboratories use the sample preparation and instrumental method.

Analysis of variance (ANOVA) is used if the data meet the general assumptions of the ANOVA procedure, homogeneity of variances and normality. Bartlett's test is used for testing homogeneity of variances and the Shapiro-Wilk test is used for testing normality.[13,14] If the ANOVA assumptions are violated, the Box-Cox transformation procedure is used to examine the data for possible transformations to correct the problem.[13] If the transformed data meet the ANOVA assumptions, then the ANOVA tests are performed on the transformed data. If homogeneity of variance and normality are not achieved by transformation of the data, then a nonparametric approach is used.

In instances where variances are homogeneous and data are normally distributed (either before or after transformation), a one-way ANOVA followed by the Scheffe's multiple comparison test procedure is performed to test for differences in bias among the combinations of the principal sample preparation techniques and instrumental methods.[15] A two-way ANOVA followed by Scheffe's

TABLE 4. Certified Reference Materials

NIST Standard Reference Materials (SRMs)	Lead
SRM 1579a Powdered paint	11.995 ± 0.031%
SRM 2580 Powdered paint (to be released in 1995)	nominal value 4%
SRM 2581 Powdered paint (to be released in 1995)	nominal value 0.5%
SRM 2582 Powdered paint (total lead by weight)	208.8 ± 4.9 ppm
SRM 2709 Lead in soil	18.9 ± 0.5 ppm
SRM 2710 Lead in soil	5532 ± 80 ppm
SRM 2711 Lead in soil	1162 ± 31 ppm
SRM 2583 Lead in household dust (to be released in 1995)	nominal value 100–200 ppm
SRM 2579 Lead paint film on Mylar (set of 5)	3.53 ± 0.24 mg/cm^2
	1.63 ± 0.08 mg/cm^2
	1.02 ± 0.04 mg/cm^2
	0.29 ± 0.01 mg/cm^2
	less than 0.001 mg/cm^2
(Intended for checking the calibration of portable X-ray fluorescence analyzers when testing for lead in paint coatings on interior and exterior building surfaces in the field.)	
SRM 1648 Urban particulate matter	0.655 ± 0.008%
SRM 2704 Buffalo River sediment (total lead by weight)	161 ± 17 ppm
EPA/A2LA Certified Reference Materials	
Commercial supplier: RT Corporation through Fisher Scientific	
SRS014-50 Bag house dust	1914 ± 180 ppm*
SRS013-50 Paint blasting waste	643 ± 56 ppm*
SRS006-50 Paint sludge	753 ± 51 ppm*

*The concentrations of lead determined in a sample following digestion by EPA Method 3010, 3020, or 3050. All concentrations expressed on dry weight basis. The 50-g samples should be mixed well before removing subsamples.

multiple comparison test procedure to test for any difference among principal sample preparation techniques and principal instrumental methods is also performed. Two-way ANOVAs separate bias that may be the result of sample preparation, instrumental method, or interaction of these two factors.

In instances where ANOVA cannot be performed on either the original data or transformed data, one of two nonparametric tests is performed. If transformed data meet the homogeneity of variances but not the normality assumptions, then the Kruskal-Wallis rank sums test followed by the Mann-Whitney-Wilcoxon test with a Bonferroni adjustment is used.[16] If no transformation can equalize the variances, then the median scores test followed by the sign test with Bonferroni adjustment is used.[17]

Analyses of ELPAT round 8 data were performed to identify statistically significant bias differences among digestion techniques and instrumental methods. Sufficient data were reported to make comparisons among four digestion techniques: NIOSH 7082/7105 (a nitric/hydrogen peroxide digestion), EPA SW846-3050A (a nitric/hydrogen peroxide digestion), EPA SW846-3051 (a nitric acid digestion), and EPA AREAL (a nitric/hydrochloric acid digestion), and among three instrumental methods: FAA, GFAA, and ICP-AES.

One-way ANOVA procedures found bias among digestion technique/instrumental method combinations for 5 of the 24 samples provided in round 8: paint chip samples 1 and 3, soil samples 1 and 3, and dust wipe sample 4. Subsequent multiple comparison procedures generally attributed these biases to various sample digestion techniques with ICP-AES analysis giving lower results than various sample digestion techniques with FAA analysis. For soil sample 1, the multiple comparison procedure could not attribute differences in bias to any factor or combination of factors. For paint chips, the biases between sample digestion techniques/instrumental method combinations ranged from 2 to 6 percent of the corresponding ELPAT reference laboratory mean, from 7 to 8 percent for dust wipes, and from 15 to 22 percent for soil sample 3.

Two-way ANOVA procedures separate bias that may be the result of sample preparation, instrumental method, or interaction of these two factors. Two-way ANOVAs found five instances where bias was statistically significant: paint chip samples 1 and 3, soil sample 4, and dust wipe samples 2 and 4. Subsequent multiple comparison tests attributed all five of these biases involving all three matrices to ICP-AES giving 3 to 8 percent lower results than FAA. In addition, ICP-AES gave lower results (6 to 10%) than GFAA on one sample from all three matrices.

To summarize, ELPAT round 8 findings are consistent with findings on previous rounds that ICP-AES can give lower results than FAA, but this bias is generally under 18 percent. This finding is also consistent with an EPA-sponsored collaborative test conducted by RTI which discussed how to minimize ICP-AES/FAA bias.[11]

Similarly, ICP-AES sometimes can give lower results than GFAA, and the magnitude of this bias is similar to the ICP-AES/FAA bias. No bias analysis of lab XRF has been undertaken on ELPAT data because data are very limited. However, no laboratory using lab XRF has been able to consistently meet ELPAT performance limits.

Occasionally, some biases in the ELPAT Program have been attributed to sample digestion techniques or in combination with instrumental methods. A wide variety of sample digestion techniques, including various leaching techniques, are reported. To date, only hotplate and microwave sample digestion techniques have been studied for bias and no consistent pattern in sample digestion technique bias has been found. However, uncovering a pattern in sample digestion technique bias may be difficult in ELPAT studies since: (1) the categorization of sample digestion techniques is not very detailed, (2) laboratories use a wide variety of sample digestion techniques, and (3) no follow-up is performed to verify sample preparation information provided by laboratories.

Lead Reference Materials

The ELPAT Program is designed to supplement, but not replace, a laboratory's internal quality control program. Use of materials of known lead content in suitable matrices is important in obtaining accurate and reliable lead results. Such materials should be used to validate methods when sample preparation techniques or instrumental methods are adopted or modified. In addition, the materials should be used for daily quality control charting of laboratory/analyst performance. ELPAT paint chip, soil, and dust wipe samples from completed ELPAT rounds are available from AIHA at the address listed at the end of this column. ELPAT materials differ from the certified reference materials listed below. Either ELPAT materials are destroyed in one analysis (dust wipes), or the amount of material in bottles is limited to reduce the number of times that analyses can be repeated by laboratories reporting in the proficiency test round. National Institute of Standards and Technology (NIST) standard reference material (SRM) values report lead as total lead, whereas ELPAT- and EPA-certified reference materials report extractable lead.

Certified reference materials are commercially available from NIST and from commercial reference material suppliers participating in the EPA/A2LA environmental reference material certification program.[18] The materials listed in Table 4 are useful for daily quality control of analyses and initial evaluation of methods associated with residential or steel structure lead abatement. Since work continues on developing additional reference materials, this list of certified reference materials is subject to significant change. Updated lists of available certified reference materials are available from NIST, EPA-EMSL Cincinnati, and A2LA at the addresses listed at the end of this column.

EPA NLLAP

Under Title X of the Housing and Community Development Act of 1992, EPA, in consultation with the Department of Health and Human Services, has the responsibility to review and determine if effective voluntary laboratory accreditation systems are in place. If EPA determines that effective voluntary laboratory accreditation systems are not in place, EPA is responsible to establish a federal laboratory certification system.[19]

The EPA has established an NLLAP to recognize laboratories performing analysis associated with lead abatement. NLLAP recognition of laboratories analyzing lead in paint chips, soils, and dusts has two requirements: (1) successful participation in proficiency testing using real-world matrices; and (2) laboratory accreditation including on-site assessment of laboratory operations. NLLAP requirements are based upon the recommendations of a Federal Interagency Taskforce on Lead Based Paint, a group of 17 federal agencies involved with lead issues, that recognition should be based upon both proficiency testing and laboratory accreditation.[20] Similarly, proficiency testing and laboratory accreditation requirements were also part of the recommendations for environmental laboratories of a 1991 National Conference on Laboratory Issues in Childhood Lead Poisoning Prevention sponsored by the Association of State and Territorial Public Health Laboratory Directors, the CDC, and EPA. NLLAP requirements for laboratories are based upon Guide 25-1990, "General Requirements for the Competence of Calibration and Testing Laboratories,"[21] a guide already in use by many national laboratory accreditation systems worldwide.

The ELPAT Program began providing paint chip, soil, and dust audit samples to evaluate laboratory performance in the fall of 1992 and has grown to over 300 participating laboratories. In December 1993 the first two laboratory accreditation organizations, A2LA and AIHA, were recognized by NLLAP. Laboratories interested in obtaining accreditation information such as the program requirements, time needed to complete the process, and cost should contact the recognized laboratory accreditation organizations. If other laboratory accreditation organizations are recognized, this information will be included in subsequent ELPAT columns.

Laboratory accreditation takes some time to achieve. Laboratory accreditation involves submittal of a description of a laboratory's quality system and manual to the accrediting organization and the on-site evaluation by NLLAP qualified assessors of laboratory operations including equipment, facilities, analytical methods, staff, and internal quality control.

Lists of laboratories that have performed successfully (rated proficient) in the ELPAT Program are prepared at NIOSH and are provided upon request to the public via a toll-free number by the Lead Information Clearinghouse (1-800-424-LEAD). The accreditation status of laboratories is included on the list of NLLAP-recognized laboratories provided to the public.

Once a sufficient number of laboratories (several hundred) geographically dispersed across the United States have received accreditation, only accredited laboratories that are ELPAT proficient will be NLLAP recognized and included on the list of laboratories provided to the public by the Lead Information Clearinghouse. Given the capacity of cooperating laboratory accreditation organizations to perform on-site assessments and initial laboratory demand for accreditation, it is projected that this will occur in 1995. Participation in the ELPAT proficiency testing program would continue to be open to all interested laboratories. That means laboratories outside the United States and laboratories that do not wish to be accredited can continue to participate in ELPAT.

Upcoming ELPAT Round Information

Round 10 ELPAT samples were sent to participants on February 1, 1995. The reporting date of the laboratories was March 9, 1995. The dust wipes were preserved with 0.5 ml of 3 percent hydrogen peroxide solution. This is to retard the formation of any fungal growth in the samples, and should not have any effect on the digestion and analysis of them. Also, the ELPAT automated data entry system is available to laboratories that want to submit their laboratory data over a modem for faster and more reliable means of transmittal.

Disclaimer

Mention of company names or products does not constitute endorsement by the CDC.

Information

A2LA laboratory accreditation, certified reference materials, and seminars on environmental lead laboratory accreditation:

American Association for Laboratory Accreditation (A2LA)
656 Quince Orchard Road
Gaithersburg, MD 20878
Phone: (301) 670-1377
FAX: (301) 869-1495

AIHA laboratory accreditation, ELPAT Program information, ELPAT sample orders, and seminars on environmental lead laboratory accreditation:

ELPAT Coordinator
American Industrial Hygiene Association (AIHA)
2700 Prosperity Avenue, Suite #250
Fairfax, VA 22031
Phone: (703) 849-8888
FAX: (703) 207-3561

Orders for the ASTM Standards on Lead-Based Paint Abatement in Buildings publication:

ASTM Customer Service
1916 Race Street
Philadelphia, PA 19103
Phone: (215) 299-5585
FAX: (215) 977-9679

Orders for NIST SRMs:

National Institute of Standards and Technology
Standards Reference Materials Program
Room 204, Building 202
Gaithersburg, MD 20899
Phone: (301) 975-6776
FAX: (301) 948-3730

Orders for RT Corporation commercial reference materials:

RT Corporation
2931 Soldier Springs
P.O. Box 1346
Laramie, WY 82070
Phone: (307) 742-5452
FAX: (307) 745-7936
or Fischer Scientific representative at (800) 766-7000.

Information on other EPA-certified reference materials:

Jim Longbottom
EPA-EMSL
Quality Assurance Research Division
26 West Martin Luther King Drive
Cincinnati, OH 45268
Phone: (513) 569-7308
FAX: (513) 569-7115

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