



PAT Program: Proficiency Analytical Testing (PAT) Program

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Introduction

The Proficiency Analytical Testing (PAT) Program is a collaborative effort of the American Industrial Hygiene Association (AIHA) and researchers at the National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC). The PAT Program provides quality control reference samples to over 1400 occupational health and environmental laboratories in over 15 countries. Although one objective of the PAT Program is to evaluate the analytical ability of participating laboratories, the primary objective is to assist these laboratories in improving their laboratory performance.

Each calendar quarter (designated a round), samples are mailed to participating laboratories and the data are analyzed to evaluate laboratory performance on a series of analyses. Each mailing and subsequent data analysis are completed in time for participants to obtain repeat samples and to correct analytical problems before the next calendar quarter starts. The PAT Program currently includes four sets of samples, as shown in Table I.

A mixture of three of the four possible metals, and three of the fifteen possible organic solvents, are rotated for each round. Asbestos alternates between amosite and chrysotile; no asbestos fiber mixtures are provided. Each set consists of four concentration levels and a blank. The metals, silica, and asbestos samples are on filters and the organic solvents are on charcoal tubes. The organic solvent set also includes five blank charcoal tubes for desorption efficiency determination.

Laboratories are evaluated for each analysis by comparing their reported results against an acceptable performance limit for each PAT Program sample the laboratory analyzes. Reference lab-

oratories are preselected to provide the performance limits for each sample. These reference laboratories must meet the following criteria: 1) the laboratory was rated proficient in the last PAT evaluation of all the contaminants in the Program; and 2) the laboratory, if located in the United States, is AIHA accredited. After the data from the reference laboratories are collected and statistically treated, the mean of the collected data is called the reference value and the performance limits equal the mean ± 3 standard deviations. Data are acceptable if they fall within the performance limits. Data falling outside the performance limits are reported as outliers.

Laboratories are rated based upon performance in the PAT Program over the last year (i.e., four calendar quarters) as well as on individual contaminant performance and overall performance. Individual contaminants are metals, silica, asbestos, and organic solvents. Individual contaminant performance is rated as: 1) proficient if all results have been reported and all are classified as acceptable for the last two consecutive rounds; and 2) proficient in all

other cases if three-fourths or more of the results reported in the last four consecutive rounds are classified as acceptable. Overall laboratory performance is rated as: 1) proficient if two-thirds or more of the individual PAT contaminants are rated proficient; but 2) nonproficient if any individual PAT contaminants are rated nonproficient for more than four consecutive times (i.e., one year).[®]

PAT Round 113, April 1993

A total of 1412 laboratories were enrolled in the PAT Program with 1324 laboratories submitting results on Round 113. Table II lists the reference values, performance limits, and participants for each sample type in the Program. A total of 91.5 percent of the 1374 laboratories evaluated were rated overall proficient this time.

As mentioned in an earlier column, a study was undertaken to determine the solubility of polyvinyl chloride (PVC) filters for silica analysis using tetrahydrofuran (THF).[®] All four brands of PVC filters studied showed acceptable solubility, and a detailed protocol

TABLE I. Current Sets of Samples in Proficiency Analytical Testing (PAT) Program

Metals	Silica	Asbestos (PCM Fiber Counting)	Organic Solvents
Cadmium	Quartz	Amosite	Benzene
Chromium		Chrysotile	Carbon tetrachloride
Lead			Chloroform
Zinc			1,2-Dichloroethane
			p-Dioxane
			Hexane
			Methylene chloride
			Methyl chloroform
			Methyl ethyl ketone
			Methyl isobutyl ketone
			Octane
			Tetrachloroethylene
			Toluene
			Trichloroethylene
			o-Xylene

TABLE II. Reference Values, Performance Limits, and Participants for Each Sample Type; PAT Round 113 (April 1993)

Contaminant	Sample Number	Number of Reference Labs	Reference Value	Relative Std. Dev. (%)	Performance Limits	Number of Labs	Number of Outliers
Cadmium	1	65	0.0118 mg	5.0	0.0100-0.0135 mg	384	21
	2	65	0.0049 mg	5.3	0.0042-0.0056 mg	384	28
	3	65	0.0079 mg	4.5	0.0069-0.0089 mg	384	25
	4	65	0.0166 mg	4.5	0.0144-0.0187 mg	384	17
Lead	1	65	0.0861 mg	4.2	0.0753-0.0969 mg	389	23
	2	65	0.0443 mg	3.9	0.0391-0.0494 mg	389	30
	3	65	0.0222 mg	5.0	0.0189-0.0255 mg	389	29
	4	65	0.0511 mg	3.4	0.0459-0.0563 mg	389	38
Zinc	1	65	0.0765 mg	7.0	0.0604-0.0925 mg ^a	382	17
	2	65	0.1263 mg	3.6	0.1127-0.1399 mg	382	34
	3	65	0.1703 mg	4.0	0.1499-0.1906 mg	382	29
	4	65	0.0960 mg	3.9	0.0847-0.1074 mg	382	30
Silica	1	59	0.0899 mg	22.8	0.0284-0.1513 mg	94	1
	2	59	0.0766 mg	23.3	0.0232-0.1301 mg	94	0
	3	59	0.1025 mg	21.6	0.0361-0.1688 mg	94	2
	4	59	0.1609 mg	23.4	0.0479-0.2739 mg	94	0
Asbestos (chrysotile)	1	63	551 f/mm ²	25.4	202-1071 f/mm ²	1145	63
	2	63	253 f/mm ²	25.0	94-488 f/mm ²	1145	71
	3	63	193 f/mm ²	26.3	70-378 f/mm ²	1145	86
	4	63	489 f/mm ²	25.8	177-954 f/mm ²	1145	97
Chloroform	1	66	0.8613 mg	4.6	0.7422-0.9804 mg	362	29
	2	66	1.3682 mg	4.9	1.1671-1.5693 mg	362	28
	3	66	0.9853 mg	5.0	0.8385-1.1321 mg	362	27
	4	66	0.4776 mg	5.7	0.3954-0.5598 mg	362	24
Carbon Tetrachloride	1	66	0.9549 mg	4.6	0.8236-1.0862 mg	362	39
	2	66	0.5135 mg	5.4	0.4300-0.5969 mg	362	41
	3	66	1.3766 mg	4.8	1.1805-1.5728 mg	362	43
	4	66	1.6350 mg	4.5	1.4163-1.8537 mg	362	46
1,2-Dichloroethane	1	66	1.4336 mg	3.4	1.2870-1.5802 mg	362	52
	2	66	0.9111 mg	3.3	0.8222-1.0001 mg	362	46
	3	66	1.0610 mg	3.6	0.9475-1.1745 mg	362	44
	4	66	0.5507 mg	3.4	0.4952-0.6062 mg	362	51

for sonification of the PVC filters will be prepared for inclusion in the next revision of NMAM Method 7500.⁽³⁾ The conclusion was made that the problem encountered by laboratories dissolving PVC filters with THF was only a transient one. There were no other significant changes in the samples provided to the laboratories or any unusual

problems encountered for this evaluation period.

Proficiency Ratings: PAT Rounds 110–113, July 1992–June 1993

A total of 1374 laboratories were rated based upon their performance

over the last four rounds (one year). Table III presents the PAT proficiency ratings by analytical area and overall.

Upcoming PAT Round 114, July 1993

PAT Round 114 was sent on July 1, 1993. The organic solvents in this round were benzene, o-xylene, and toluene. Metals in this round included cadmium, chromium, and lead. Also, silica had a talc background and the asbestos was amosite.

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TABLE III. PAT Proficiency Ratings Based Upon Rounds 110 to 113 (July 1992–June 1993)

Contaminant	Number of Labs Rated	Number of Labs Rated Nonproficient	Percent Labs Rated Nonproficient
Metals	402	30	7.5
Silica	100	0	0.0
Asbestos	1196	63	5.3
Organic solvents	381	58	15.2
Overall	1374	117	8.5

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