



## PAT Program: Background and Current Status

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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 Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. The PAT Program provides quality control reference samples to over 1400 occupational health and environmental laboratories in 18 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 as 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 is 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 1. A mixture of three of the four possible metals and one to three of the ten possible organic solvents are rotated for each round. Fibers alternate between amosite and chrysotile asbestos and man-made fibers; no fiber mixtures are provided. Each set consists of four concentrations and a blank. The metal, silica, and fiber samples are on filters and the organic solvents are on charcoal or silica gel tubes. The organic solvent set also includes five blank charcoal or silica gel 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 laboratories 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 labora-

TABLE 1. Current Sets of Samples in the PAT Program

Metals	Silica	Fibers (PCM Fiber Counting)	Organic Solvents
Cadmium	Quartz	Amosite	Benzene
Chromium		Chrysotile	Chloroform
Lead		Man-made fibers	1,2-Dichloroethane
Zinc			Methanol
			<i>p</i> -Dioxane
			Tetrachloroethylene
			Toluene
			1,1,1-Trichloroethane
			Trichloroethylene
			<i>o</i> -Xylene

tories are collected and statistically treated, the mean of the collected data is called the reference value and the performance limits equal the mean  $\pm 3$  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. Individual contaminants are metals, silica, fibers, 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.<sup>(1)</sup>

## PAT Round 123, October 1995

A total of 1407 laboratories were enrolled in the PAT Program, with 1299 labora-

tories submitting results on round 123. Table 2 presents the summary of the PAT proficiency ratings for each analytical area. Table 3 lists the reference values, performance limits, and participants for each sample type in the PAT Program.

The asbestos samples for this round included man-made fibers. Samples 1 and 2 contained only chrysotile fibers, and samples 3 and 4 contained only man-made fibers (fibrous glass). Examining the summary results for reference laboratories, the relative standard deviations (RSDs) for samples 1 and 2 were 37.7 and 31.4 percent, respectively, and are comparable to what has been reported for chrysotile in the past. The RSDs for samples 3 and 4 are 22.2 and 21.2 percent, respectively, and are much lower than the RSDs for chrysotile and closer to those reported for amosite in the past. The total number of outliers for each sample is similar to the number of outliers identified in previous PAT rounds for asbestos samples.

TABLE 2. PAT Proficiency Ratings Based Upon Rounds 120 to 123 (January 1995–December 1995)

Contaminant	Number of Labs Rated	Number of Labs Rated Proficient	Percent Labs Rated Proficient
Metals	388	358	92.3
Silica	91	90	98.9
Fibers	1113	1069	96.0
Organic solvents	351	316	90.0

TABLE 3. Reference Values, Performance Limits, and Participants for Each Sample Type: PAT Round 123 (October 1995)

Contaminant	Sample Number	Number of Reference Labs	Reference Value	Relative Std. Dev. (%)	Performance Limits	Number of Labs	Number of Outliers
Cadmium	1	58	0.0168 mg	4.8	0.0144–0.0192 mg	384	23
	2	58	0.0105 mg	3.4	0.0095–0.0116 mg	384	42
	3	58	0.0077 mg	4.4	0.0067–0.0087 mg	384	29
	4	58	0.0086 mg	4.2	0.0075–0.0097 mg	384	39
Lead	1	58	0.0250 mg	6.5	0.0202–0.0299 mg	389	14
	2	58	0.0860 mg	3.7	0.0765–0.0955 mg	389	33
	3	58	0.0545 mg	4.4	0.0473–0.0617 mg	389	28
	4	58	0.0333 mg	3.8	0.0295–0.0371 mg	389	45
Zinc	1	58	0.1898 mg	5.1	0.1609–0.2186 mg	382	27
	2	58	0.1517 mg	4.1	0.1331–0.1704 mg	382	40
	3	58	0.0956 mg	4.4	0.0831–0.1080 mg	382	35
	4	58	0.0520 mg	5.1	0.0440–0.0600 mg	382	39
Silica	1	56	0.1051 mg	20.8	0.0395–0.1708 mg	84	2
	2	56	0.1167 mg	18.1	0.0533–0.1800 mg	84	1
	3	56	0.1406 mg	20.8	0.0528–0.2283 mg	84	2
	4	56	0.0587 mg	21.8	0.0204–0.0971 mg	84	3
Fibers*	1	58	119 f/mm <sup>2</sup>	37.7	22–292 f/mm <sup>2</sup>	1104	68
	2	58	454 f/mm <sup>2</sup>	31.4	127–984 f/mm <sup>2</sup>	1104	65
	3	58	116 f/mm <sup>2</sup>	22.2	52–207 f/mm <sup>2</sup>	1104	79
	4	58	191 f/mm <sup>2</sup>	21.2	89–331 f/mm <sup>2</sup>	1104	69
Chloroform	1	58	0.1953 mg	6.5	0.1570–0.2336 mg	347	25
	2	58	0.6677 mg	4.5	0.5775–0.7579 mg	347	33
	3	58	0.5879 mg	4.9	0.5009–0.6750 mg	347	31
	4	58	0.9071 mg	4.5	0.7845–1.0296 mg	347	31
1,2-Dichloroethane	1	58	0.2625 mg	4.7	0.2255–0.2995 mg	347	32
	2	58	0.3597 mg	5.1	0.3047–0.4147 mg	347	26
	3	58	0.6392 mg	3.9	0.5642–0.7143 mg	347	34
	4	58	0.8382 mg	4.1	0.7347–0.9417 mg	347	33
Tetrachloroethylene	1	58	0.6255 mg	5.3	0.5254–0.7256 mg	346	36
	2	58	0.1716 mg	9.9	0.1207–0.2225 mg	346	24
	3	58	0.8105 mg	6.3	0.6565–0.9646 mg	346	28
	4	58	0.4658 mg	6.3	0.3782–0.5534 mg	346	30

\*Samples 1 and 2 are chrysotile; samples 3 and 4 are man-made fibers.

#### PAT Round 124, January 1996

PAT round 124 was sent to participating laboratories on January 2, 1996. The organic solvents in this round were 1,2-dichloroethane, tetrachloroethylene, and trichloroethylene. Metals in this round included cadmium, chromium, and lead.

Silica had a coal mine dust background and fibers were amosite.

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