



## PAT Program Report: Background and Current Status

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# PAT Program Report

## Background and Current Status

Jensen H. Groff and Paul C. Schlecht, Column Editors

### 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). 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 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 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 combination of three metals and three organic solvents is rotated for each round. Asbestos is rotated among amosite and chrysotile; no 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 Pro-

gram 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 laboratories 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 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 quarters 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., 1 year).<sup>(1)</sup>

### PAT Round 108, January 1992

A total of 1445 laboratories were enrolled in the PAT Program with 1359 laboratories submitting results on Round 108. This is a decrease of 125 laboratories from Round 107 last year. The majority of these laboratories only analyzed asbestos in the PAT Program. Table II lists the reference values, performance limits, and participants for each sample type in the Program. There was another small increase in the number of lab-

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 108 (January 1992)**

Contaminant	Sample Number	Number of Reference Labs	Reference Value	Relative Standard Deviation (%)	Performance Limits	Number of Labs	Number of Outliers
Cadmium	1	70	0.0099 mg	5.1	0.0084-0.0113 mg	375	18
	2	70	0.0147 mg	5.0	0.0126-0.0169 mg	375	19
	3	70	0.0190 mg	4.4	0.0165-0.0215 mg	375	25
	4	70	0.0069 mg	5.3	0.0059-0.0079 mg	375	22
Chromium	1	70	0.0744 mg	5.6	0.0619-0.0868 mg	370	25
	2	70	0.1713 mg	6.3	0.1392-0.2034 mg	370	24
	3	70	0.1010 mg	5.6	0.0839-0.1181 mg	370	30
	4	70	0.1470 mg	5.9	0.1209-0.1730 mg	370	34
Lead	1	70	0.0494 mg	4.3	0.0431-0.0556 mg	380	29
	2	70	0.0783 mg	4.6	0.0676-0.0889 mg	380	23
	3	70	0.0304 mg	4.2	0.0266-0.0342 mg	380	42
	4	70	0.0592 mg	3.9	0.0523-0.0662 mg	380	30
Silica	1	68	0.0901 mg	20.5	0.0346-0.1455 mg	101	4
	2	68	0.1500 mg	16.3	0.0766-0.2234 mg	101	7
	3	68	0.1203 mg	22.3	0.0400-0.2006 mg	101	5
	4	68	0.1316 mg	20.8	0.0497-0.2134 mg	101	3
Asbestos (amosite)	1	69	798 f/mm <sup>2</sup>	15.3	471-1211 f/mm <sup>2</sup>	1209	82
	2	69	496 f/mm <sup>2</sup>	16.4	282-770 f/mm <sup>2</sup>	1209	78
	3	69	233 f/mm <sup>2</sup>	19.8	116-389 f/mm <sup>2</sup>	1209	101
	4	69	357 f/mm <sup>2</sup>	17.0	198-563 f/mm <sup>2</sup>	1209	100
1,1,1-Trichloroethane	1	70	1.2040 mg	4.5	1.0431-1.3649 mg	369	23
	2	70	1.0383 mg	4.3	0.9050-1.1717 mg	369	28
	3	70	0.7410 mg	5.6	0.6171-0.8649 mg	369	20
	4	70	0.5531 mg	4.6	0.4760-0.6301 mg	369	25
Tetrachloroethylene	1	70	1.0194 mg	3.0	0.9271-1.1117 mg	369	58
	2	70	0.5089 mg	4.0	0.4474-0.5704 mg	369	51
	3	70	0.6936 mg	4.1	0.6088-0.7785 mg	369	45
	4	70	1.1944 mg	3.8	1.0593-1.3295 mg	369	56
Trichloroethylene	1	70	0.5640 mg	3.4	0.5064-0.6217 mg	360	37
	2	70	0.8668 mg	3.2	0.7836-0.9499 mg	369	51
	3	70	1.0966 mg	3.4	0.9851-1.2081 mg	369	43
	4	70	0.8223 mg	3.2	0.07439-0.9007 mg	369	45

laboratories rated proficient this rating period. A total of 91.7 percent of all laboratories were rated overall proficient this time.

A number of laboratories reported difficulty in separating the Round 108 silica filters from the backup pads. Also, the filters were very frag-

ile and tore easily when handled. This was due to the use of PVC filters for silica from a different manufacturer. There also were static problems with the filters and sealing problems with the cassettes. The supplier of filters and cassettes for silica analyses was changed last year

because of supply and delivery problems. However, the two subsequent suppliers have not been acceptable and the sample production contractor has again received a new supply of PVC filters and cassettes from the original supplier for the next PAT Program round. In spite of these problems, the variability of Round 108 silica results were similar to previous rounds.

**TABLE III. PAT Proficiency Ratings Based Upon Rounds 105 to 108 (April 1991-March 1992)**

Contaminant	Number of Labs Rated	Number of Labs Rated Nonproficient	Percent Labs Rated Nonproficient
Metals	393	40	10.2
Silica	108	5	4.6
Asbestos	1256	70	5.6
Organic solvents	379	40	10.6
Overall	1406	117	8.3

**Proficiency Ratings: PAT Rounds 105-108, April 1991-March 1992**

A total of 1406 laboratories were rated based upon their performance over the last four rounds (1 year). Table III presents the PAT proficiency ratings by analytical area and overall.

## Upcoming PAT Round 109, April 1992

PAT Round 109 was sent on April 1, 1992. The organic solvents in this round were chloroform, carbon tetrachloride, and 1,2-dichloroethane. Metals in this round included cad-

mium, lead, and zinc. Also, silica had a calcite background and the asbestos was chrysotile.

### Reference

1. Groff, J.H.; Schlecht, P.C.; Shulman, S.: Laboratory Reports and Rating Criteria for

the Proficiency Analytical Testing (PAT) Program. DHHS, (NIOSH) Publ. No. 91-102. Cincinnati, OH (1990).

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