



## PAT Program

Proficiency Analytical Testing 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 Centers for Disease Control and Prevention (CDC), 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 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 3 of the 4 possible metals, and 3 of the 15 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 concentrations 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 analyses. 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  $\pm 3$  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-fourths or more of the results reported in the last four consecutive rounds are classified as acceptable. Overall laboratory per-

formance 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>10</sup>

### PAT Round 115, October 1993

A total of 1474 laboratories were enrolled in the PAT Program with 1361 laboratories submitting results on Round 115. Table II lists the reference values, performance limits, and participants for each sample type in the PAT Program. A total of 89.7 percent of the 1433 laboratories evaluated were rated overall proficient this time. There were no significant changes in the samples provided to the laboratories nor any unusual problems encountered for this evaluation period.

### Proficiency Ratings: PAT Rounds 112-115, January-December 1993

A total of 1433 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.

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
			Tetrachloroethylene
			Toluene
			1,1,1-Trichloroethane
			Trichloroethylene

**TABLE II. Reference Values, Performance Limits, and Participants for Each Sample Type; Pat Round 115 (October 1993)**

Contaminant	Sample No.	No. of Reference Labs	Reference Value	Relative Standard Deviation (%)	Performance Limits	No. of Labs	No. of Outliers
Cadmium	1	62	0.0177 mg	4.1	0.0150-0.0198 mg	399	34
	2	62	0.0108 mg	3.6	0.0097-0.0119 mg	399	41
	3	62	0.0069 mg	4.6	0.0060-0.0078 mg	399	23
	4	62	0.0137 mg	4.5	0.0119-0.0155 mg	399	24
Lead	1	62	0.0214 mg	5.7	0.0178-0.0250 mg	403	31
	2	62	0.0931 mg	4.1	0.0816-0.1045 mg	403	31
	3	62	0.0281 mg	4.5	0.0243-0.0318 mg	403	38
	4	62	0.0676 mg	4.5	0.0586-0.0767 mg	403	26
Zinc	1	62	0.1407 mg	4.3	0.1224-0.1590 mg	396	39
	2	62	0.0849 mg	4.6	0.0732-0.0967 mg	396	41
	3	62	0.0628 mg	4.6	0.0542-0.0714 mg	396	43
	4	62	0.1753 mg	5.0	0.1493-0.2013 mg	396	28
Silica	1	61	0.1257 mg	23.8	0.0362-0.2152 mg	95	1
	2	61	0.0653 mg	29.3	0.0080-0.1226 mg	95	2
	3	61	0.0756 mg	25.6	0.0175-0.1337 mg	95	2
	4	61	0.0822 mg	21.8	0.0284-0.1360 mg	95	0
Asbestos (chrysotile)	1	62	532 f/mm <sup>2</sup>	21.8	237-945 f/mm <sup>2</sup>	1169	82
	2	62	515 f/mm <sup>2</sup>	22.4	223-927 f/mm <sup>2</sup>	1169	75
	3	62	217 f/mm <sup>2</sup>	24.5	88-404 f/mm <sup>2</sup>	1169	99
	4	62	260 f/mm <sup>2</sup>	25.7	99-497 f/mm <sup>2</sup>	1169	157
Carbon tetrachloride	1	62	0.8860 mg	4.6	0.7638-1.0083 mg	366	37
	2	62	0.6013 mg	4.8	0.5150-0.6877 mg	366	43
	3	62	1.7813 mg	4.1	1.5631-1.9996 mg	366	42
	4	62	1.1986 mg	3.3	1.0795-1.3178 mg	366	62
1,2 Dichloroethane	1	62	1.0188 mg	5.2	0.8604-1.1773 mg	366	25
	2	62	1.5863 mg	3.6	1.4148-1.7577 mg	366	51
	3	62	1.3786 mg	4.3	1.2005-1.5566 mg	366	33
	4	62	0.7085 mg	4.4	0.6150-0.8021 mg	366	36
Trichloroethylene	1	62	1.3881 mg	4.5	1.2014-1.5748 mg	366	30
	2	62	1.1161 mg	4.8	0.9543-1.2779 mg	366	29
	3	62	0.6049 mg	5.4	0.5078-0.7021 mg	366	27
	4	62	0.9124 mg	4.2	0.7963-1.0285 mg	366	35

**Upcoming PAT Round 116, January 1994**

PAT Round 116 was sent on January 3, 1994. The organic solvents in this round were 1,1,1-trichloroethane, tetrachloro-

ethylene, and trichloroethylene. Metals in this round included cadmium, chromium, and lead. Also, silica had a coal mine dust background and the asbestos was amosite.

**Reference**

- Groff, J.H.; Schlecht, P.C.; Shulman, S.: Laboratory Reports and Rating Criteria for the Proficiency Analytical Testing (PAT) Program. DHHS (NIOSH) Pub. No. 91-102. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Cincinnati, OH (1990).

**TABLE III. Proficiency Analytical Testing Proficiency Ratings Based Upon Rounds 112 to 115 (January 1993-December 1993)**

Contaminant	No. of Labs Rated	No. of Labs Rated Nonproficient	% Labs Rated Nonproficient
Metals	416	41	9.9
Silica	97	0	0.0
Asbestos	1234	83	6.7
Organic solvents	382	61	16.0
Overall	1433	147	10.3

*Editorial Note:* Jensen H. Groff and Paul C. Schlecht are with the Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.