file Asbestos ORC Task Force

National Place, Suite 911
1331 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
202-737-6330

Organization Resources Counselors, Inc.

Memorandum

June 1, 1988

To: ORC Asbestos Data Collection Task Force

From: Darrell K. Mattheis and Rebecca L. Daiss

Subject: Short Term Sampling Method for Asbestos

Attached, for your information, is the correspondence we have received in response to our request for recommendations on the most appropriate method of collecting short term (i.e. 15 minute) asbestos samples. Our thanks to those Task Force members who submitted comments. Your efforts are greatly appreciated. Because the recommendations and opinions vary so widely, however, we have been unable to single out a preferred 15 minute sampling method as yet.

Please review the attached material, distribute it internally, and submit your comments regarding the best short term sampling approach to ORC as soon as possible. If we are still unable to reach agreement on the most appropriate method after receiving your comments, we will likely hold a special session between Task Force members and acknowledged experts in the field in order to resolve the issue. Please let us know if you believe such a meeting is necessary.

Meanwhile, the Asbestos Data Collection Project is moving forward as the OSHA Recommended Method (ORM) is appropriate for all small job asbestos sampling other than short term. We have received over 100 data collection sheets to date. The first batch of survey sheets will be submitted to our contractor for data entry this month. We encourage you to continue collecting and submitting data on those jobs where it is possible to collect valid samples, as it is important that we maintain a continuous flow of information.

BD4 Darrell K. Mattheis
Rebecca L. Daiss

PLAINTIFF'S EXHIBIT AL-938

GTE Service Corporation
One Stamford Forum
Stamford CT 06904
203 965-2000

May 11, 1988

Mr. Darrell K. Mattheis
Organization Resources Counselors, Inc.
1331 Pennsylvania Avenue, NW
Washington, DC 20004

Re: Short Term Asbestos Sampling

Dear Darrell,

The level of airborne asbestos fibers reported by a laboratory for a short term sample where no or little asbestos is collected on a filter will depend on the "lower limit of detection" used by the laboratory. For most materials, the lower limit of detection is fairly constant among IH laboratories but for asbestos there are at least two in use.

The lab we use at GTE for our asbestos samples (NATLSCO), uses a lower limit of detection of 2 fibers per 100 fields. Therefore, a 15 minute sample collected at a flow rate of 2 liters per minute where no asbestos is detected will yield a result of less than 0.03 fibers per cubic centimeter. This result, of course, is well below the OSHA Action Level of 0.1 f/cc.

The NIOSH 7400 analytical method for asbestos claims a lower limit of detection of 10 fibers per 100 fields. A 15 minute sample at 2 LPM where no asbestos was found will thus yield a result of less than 0.16 f/cc. This result, of course, is not much help in making comparisons against the OSHA standard.

Appendix A to the OSHA Asbestos Standard references the NIOSH 7400 method for analysis but does not mandate the lower limit of detection to be used. According to NATLSCO, it is well recognized that 10 fibers/100 fields is an impractical lower limit of detection. Apparently, the OSHA lab in Salt Lake City also uses 2 fibers/100 fields as the lower limit of detection.

It would appear that if all the participating companies uniformly use 2 fibers/100 fields as the lower limit of detection there is no problem with short, 15 minute samples.

If you would like to discuss this in more detail, feel free to contact me or Joan Wronski, Manager-Analytical Lab, NATLSCO 312-540-2488.

Very truly yours,

Donald M. Espach
Director-Employee Safety

DME:lr:2780p

cc: J. Wronski

April 27, 1988

Mr. Darrell Mattheis
Organization Resource Counselors
National Place Suite 911
1331 Pennsylvania Avenue, NW
Washington, DC 20004

Dear Mr. Mattheis:

Dean Chappell of GTE Service Corporation has asked me to respond directly to you in regard to your April 7th memo of short term asbestos monitoring. Please understand that these comments are my own and do not necessarily reflect the opinion of Mr. Chappell or GTE Service Corporation. Because of Mr. Chappell's schedule, he was unable to review this letter prior to transmittal.

For the type of exposures that service companies will encounter in the process of pulling cable, as well as in other activities, it is important to have a Short Term Exposure Limit in order to adequately evaluate the employees' asbestos exposures. This limit must, however, be based upon toxicological data suggesting a cause and effect relationship between the short term exposure limit and the development of an asbestos related disease. The answer to this question can only be provided by toxicologists and epidemiologists.

Consider for the moment the following example. An employee is pulling cable across a beam insulated with highly friable blown-on insulation. It takes only a minute to pull the length of cable. But, in that time period, he is exposed to 48 f/cc of asbestos. Also assume that he does not experience any other asbestos exposure for the remainder of the day, a condition which is not that unlikely. His calculated 8 hour time weighted average exposure would be 0.1 f/cc. In other words, his exposure would be at the Action Level for asbestos. Yet, it just doesn't seem good industrial hygiene practice to be exposing employees to that high a concentration. Using this same example, the worker's 15 minute time weighted average exposure would be 3.2 f/cc, still somewhat high.

National Loss Control Service Corporation
Long Grove, Illinois 60049-0075 (312) 540-2400 TWX (910) 651-3571 Toll Free 800-323-9585

The technology now exists to collect short term (i.e., fifteen minute) samples using the current sampling and analytical techniques. Your suggestion of raising the pump flow rate to 5 lpm is one way to collect more sample and thus lower the lower limit of detection of the analytical method. However, from a practical standpoint, there are many pump models that will not allow for that high a flow rate. Your suggestion about analyzing total fibers, collected regardless of sampling time, goes too far away from traditional industrial hygiene practice where the usual unit of measurement is a dose or exposure--the weight per unit volume rather than just the total count. Your final suggestion about measuring over a thirty minute period I would like to modify to suggest that, indeed, the sample be collected over a short term period of a maximum of 15 minutes - during periods of highest expected exposure (such as in the example given above). When that time has elapsed, change the filter to a fresh filter and continue monitoring for the remainder of the shift (either as a single sample or as a series of consecutive samples covering the remainder of the shift).

In summary then:

1. I believe a STEL or a Ceiling Limit is necessary for evaluating an employee's exposure to asbestos

2. Methods currently in widespread use can be used to meet this need.

3. The 8 hour time weighted average is only one point of evaluation. The electrical services and telecommunication industry needs a short term limit to more adequately evaluate its workers' exposure to asbestos in relation to the industry's unique work practices.

If you have any questions please feel free to call me on my direct dial line listed below. Likewise, if I can provide additional assistance please do not hesitate to call on me.

Very Truly Yours

John N. Garis
ecw

John N. Garis
Manager, Industrial Hygiene
Certified/Comprehensive Practice
Direct Dial Number: (312) 540-2026
JNG/ecw
5466J

cc: D.W.Chappell, GTE, Stamford
C.C.Nolan NATLSCO, Summit

Allied Signal

Allied-Signal Inc.
Health, Safety & Environmental Sciences
P.O. Box 1013R
Morristown, NJ 07960-1013

April 15, 1988

Darrell K. Mattheis
Organization Resources Counselors, Inc.
National Place, Suite 911
1331 Pennsylvania Ave., N.W.
Washington, DC 20004

Dear Darrell,

In response to your April 7 memo, 15 minute asbestos fiber samples, I think the pump flow rate should be increased. The 7402 method, issued August 15 , 1987, allows for sampling from 0.5 - 16 L/min., it does not allow for changing the counting rules by counting more fields.

I do not think there is a personal sampling pump which can handle 5 L/min. If you have to go to a larger pump, why not go all the way and sample all 16 L/min.? In tight areas you might have to consider whether you are stirring things up and affecting the results.

Hope this has been of help.

Sincerely,

G. H. Andersen
Manager, Occupational Health

cc: T. N. Stewart

Southwestern Bell Telephone
One Bell Center
St. Louis, Missouri 63101

April 18, 1988

Mr. Darrell K. Mattheis
Organization Resources Counselors, Inc.
National Place, Suite 911
1331 Pennsylvania Avenue N.W.
Washington, D.C. 20004

Dear Darrell:

This is in response to your letter dated April 7, 1988 concerning 15-minute asbestos air samples. Of the three approaches itemized in your letter, I do not consider Items 2 and 3 as viable options. I consider the best method to be increasing the flow rate of the pumps to 5 liter/min. and also increasing the maximum number of fields counted. This would decrease the chance for error and increase the minimum detection limit. I would not recommend decreasing the minimum fiber yield per air sample as this would only increase the chance for error.

You also asked for names of any experts you might be able to contact. I discussed this with Mr. William Lowry, the manager of the laboratory that does analysis work for Southwestern Bell, and he said he would assist if requested. His name and address are attached.

If you have any other questions or if I can be of further assistance, please call me on 314-235-5592.

Sincerely,

Chuck Hill

Area Manager-Safety

Attachment

CC: E. A. Towns
W. J. Lowry

Attachment

Mr. William J. Lowry
Industrial Testing Laboratories, Inc.
2350 Seventh Boulevard
St. Louis, MO 63104
314-771-7111

To: Laura Rippey ALCOA
Pittsburgh 6

From: R.A. Milito
EHL, ATC-C

March 16, 1988

Re: Mathematical Derivations Used to Generate Graphs of fibers/cc vs. air volumes (liters) based on NIOSH Method 7400 and OSHA 29 CFR Parts 1910 and 1926.

The purpose of this correspondence is to outline the approach used to determine the minimum air volumes required to obtain specific airborne fiber concentrations using a 25mm filter cassette for sampling and a Walton-Beckett graticule for analysis.

Criteria.

1. From NIOSH 7400 - Estimated LOD (Limit of Detection) = 7 fibers/mm2.
2. From NIOSH 7400 and 29 CFR Parts 1910 and 1926 the following:

A. $c = \frac{E \times Ac}{V \times 1000}$, where c = airborne fiber concentration in fibers/cc.
E = fiber density on the filter in fibers/mm2.
Ac = actual filter collection area in mm2 (385mm2 for 25mm filter and 855mm2 for a 37mm filter).
V = total air volume in liters.

B. $E = \frac{F-B}{n \times Af}$, where F = total number of fibers counted.
B = number of fibers on blank.
n = total number of fields counted.
Af = field area. 0.00785mm2 for a Walton-Beckett graticule.

Calculations.

Fiber concentrations per field based on an LOD of 7 fibers/mm2.

0.00785mm2/field X 7 fibers/mm2 = 0.055 fibers/field or 55 fibers for a 100 field minimum. This establishes the sensitivity of the method of 0.055 fibers/field. The sensitivity of the previously used NIOSH Method P & CAM 239 was determined to be 0.10 fibers/field. For our purposes, the fiber density, E = 7 fibers/mm2 can be checked by using 0.055 fibers/field in the above formula.

Determination of airborne concentrations of air volumes at the LOD (E = 7 fibers/mm2) using a 25mm filter and Formula A.

Since Formula A contains two variables-airborne fiber concentration and total air volume -- which are functions of each other, we can predict airborne concentrations (fibers/cc) by using air volumes common to asbestos fiber sampling. Since the recommended flow rate is 2.0 lpm, total volumes of 960, 480, 240, 120 and 60 liters have been selected. Since E = 7 fibers/mm2 and Ac = 385mm2 will be held constant, their product, 2695 fibers, is constant throughout this particular exercise.

Air Volume (liters)	Fibers/cc (at the LOD)
960	0.0028
480	0.0056
240	0.0112
120	0.0225
60	0.0449

Minimum air volumes required for particular airborne concentrations can also be predicted. For example, the following data was obtained by inserting given values at the LOD.

Fibers/cc	Minimum Air Volume (L)
0.20 (OSHA PEL)	13.5
0.10 (Action Level)	27.0
0.05 (1/2 Action Level)	53.9
0.01 (Clearance Level)	270.0
0.005 (1/2 Clearance Level)	539.0

Although some of the air volumes seem unrealistic with regard to attaining a Time Weighted Average, this exercise does indicate the need to sample for relatively long periods in order to provide an adequate sample to determine clearance.

Recommendations

1. When sampling for clearance, a minimum sample volume of 540 liters be obtained. This would "bracket" the clearance level of 0.01 f/cc and would provide a much more efficient analysis with regard to the mandated method.

2. When sampling for compliance, a minimum sample volume of 240 liters be obtained. This would provide one countable fiber per field on a 25mm filter when counting with a Walton-Beckett graticule.

3. Sample at a rate of 2.0 liters/min.

4. Use the attached graphs to adapt your sampling approach to your specific needs.

R. A. Milito

MOTOR VEHICLE MANUFACTURERS ASSOCIATION OF THE UNITED STATES, INC. • 300 NEW CENTER BUILDING • DETROIT, MICHIGAN 48202 • 872-4311 AREA 313

SH88-49
April 25, 1988

TO: OCCUPATIONAL SAFETY AND HEALTH COMMITTEE

FROM: Robert S. Ajemian, Secretary

SUBJECT: Proposed MVMA Statement on Michigan Asbestos Standard

Attached is a draft statement for an MVMA representative to provide at the public hearing May 10, 1988 on the proposed occupational health standards for asbestos exposure in Michigan. Several OSHC members recommended MVMA participation in the hearing in response to a March 24, 1988 Actioh Bulletin advising OSHC of this issue (SH88-38).

Dr. Bowditch, MVMA Vice President of Technical Affairs, is currently proposed as the representative to provide the testimony. Additional technical support from OSHC members or other appropriate company personnel would be necessary if detailed questions on asbestos measurements were asked.

ACTION REQUESTED

Please review the proposed statement and attachment and advise Richard T. Paul of your comments, questions, etc. by Thursday, May 5, 1988.

RSA/tlg
Attachment
cc: Asbestos Task Group
Company Counsel

Prepared by: Richard T. Paul

RECEIVED
APR 28 1988
SAFETY AND HEALTH

4/22/88 DRAFT

Draft MVMA Statement on the Proposed Michigan Standard for Asbestos Tuesday, May 10, 1988

Good Morning! My name is Dr. Fred W. Bowditch. I am the vice president of the technical affairs division of the Motor Vehicle Manufacturers Association. MVMA is the major trade association for domestic producers of cars, trucks and buses. Our members build more than 97% of the motor vehicles made in the United States and directly employ nearly 750,000 persons.

The Michigan Occupational Health Standards Commission of the Michigan Department of Public Health has proposed general industry and construction occupational health rules for asbestos. These standards include rules on employee exposures, exposure monitoring, regulated areas, method of compliance, personal protective equipment, hygiene facilities, medical surveillance and recordkeeping. The permissable exposure level, short term exposure level and action level proposed in the standard are lower by 50% than those promulgated by the U.S. Occupational Safety and Health Administration last year.

MVMA is concerned that the State of Michigan would have occupational exposure levels for asbestos which are one half of the federal standard because it is both unnecessary and infeasible. Federal OSHA has studied the scientific, technical

and health effects aspects of appropriate exposure and action levels for asbestos. They concluded, based on the best available scientific evidence, that the most appropriate and feasible permissible exposure, short term exposure and action levels are 0.2, 0.5 and 0.01 fibers per cubic centimeter of air (f/cc), respectively. MVMA participated in OSHA's rulemaking along with national and international scientists, professional organizations, organized labor and others. In effect, the most scientifically defensible decision was made by OSHA on the most complete collection of information with the broadest possible participation. They concluded that their standards were the most stringent necessary and feasible for the protection of U.S. workers. In addition, an Asbestos Advisory Committee, appointed by the Commission, recommended adoption of Federal OSHA standards with some identified, limited changes.

MVMA questions the basis for the decision by the Michigan Occupational Health Standards Commission to reduce by half the levels of asbestos exposure for Michigan workers, particularly when the levels adopted by Federal OSHA were recommended to the Commission by their own Advisory Committee.

At the April 6, 1987 Commission meeting to consider an asbestos standard for the State of Michigan, several representatives of MVMA participated in the meeting and discussed the lack of technology available to accurately and precisely

measure very low asbestos exposures. MVMA's experience has shown that current sampling methods do not permit accurate air sampling of an employee exposure in the range of 0.2 f/cc. Data from the Proficiency Analytical Testing (PAT) program of the National Institute for Occupational Safety and Health confirms this. The variance in the determined analytical values by participants of the PAT program are generally greater for asbestos than for any other material.

A more detailed and technical discussion of this is provided in a written attachment to my oral comments.

Despite these comments of the MVMA representatives at the April 6 meeting, as well as similar comments from representatives of the Asbestos Information Association, Detroit Edison and Asbestos Advisory Committee members, the Commission has proposed standards which are infeasible to determine using currently accepted methods of analysis.

In addition, the proposed lower exposure levels will have significant economic and manufacturing implications. In the past, asbestos was contained in many motor vehicle components. Over the past decade or more, MVMA members have undertaken comprehensive programs to eliminate the need for asbestos containing parts or to find substitutes. A detailed discussion of these efforts is contained in attachment II of my comments.

In spite of these efforts, in some critical applications,

asbestos continues to be used. For these situations a 0.1 f/cc PEL would dramatically effect vehicle and component manufacturers. Lead time will be required for further engineering work where elimination and substitution are feasible. Individual members may comment separately on expected lead times required to accomplish various engineering changes. In addition, in a few limited applications, such as replacement brake linings, continued asbestos usage with appropriate controls may be necessary for the lives of vehicles in service.

The control of asbestos exposure in vehicle manufacturing in the range of 0.1 f/cc PEL would be extremely difficult. Previously, we discussed the problem of evaluating compliance measures to meet this PEL with current analytical techniques. Considering control measures themselves, once asbestos-containing products are removed from the shipping containers, they are handled by several persons and travel a substantial distance during assembly. Thus, the areas in which controls might be required and the numbers of persons affected would be substantial. Possible control measures would include the use of personal protective equipment for numerous employees over an entire work shift or large ventilated enclosures which permit the passage of partially assembled vehicles.

Turning to vehicle component manufacturers, the 0.1 f/cc would also impose very significant manufacturing constraints. Since our members manufacture very few asbestos containing vehicle components, we are unfamiliar with the exact nature of

these constraints. We hope that vehicle parts manufacturers will comment on the proposed standard.

The matter of replacement brake linings for older model vehicles still in service warrants additional discussion. The ideal control approach to asbestos in brake linings is to develop substitutes. This approach is acceptable for new vehicle design because brake systems can be engineered around the characteristics of the substitute. Substituting asbestos-free brake linings without redesigning the brake system may result in reduced lining durability, adverse effects on other brake system components and even increased stopping distance. Thus, using asbestos substitutes in brake linings without carefully evaluating the consequences could result in trading reduced adverse health effects for increased traffic safety problems. Thus, the continued use of asbestos containing replacement brake linings with proper control measures may be necessary for the lives of vehicles in service.

In conclusion, MVMA urges that the Commission reconsider their proposed asbestos standard and suggest they accept the Advisory Committee recommendation to adopt Federal OSHA's asbestos rule. This will facilitate an expedient implementation of a standard for the State of Michigan and avoid further time consuming disputes, while providing the most feasible and necessary health protection of Michigan workers.

Thank you.

TECHNICAL DISCUSSION OF ANALYTICAL ASBESTOS MEASUREMENT TECHNIQUES

The new NIOSH methodology for asbestos counting, published in 1984 and adopted by OSHA in 1986, was reported by NIOSH to permit counting at filter loadings having a lower boundry of 100 f/sqmm with a coefficient of variation of 11%, based on data obtained within NIOSH. At the time the new OSHA Asbestos Standards were adopted, no published data were available which showed the degree of reproducibility between laboratories using the new method.

First NIOSH and ~~then~~ now the American Industrial Hygiene Association (AIHA) administers the Proficiency Analytical Testing (PAT) program. Those certified laboratories conducting analysis of asbestos air samples participate in a periodic round-robin program of analyzing specially prepared duplicate samples to demonstrate their proficiency and to provide a "real-world" measure of the reproducibility of the asbestos analytical method.

This method using phase contrast microscopy is required by the OSHA asbestos standard. Figure 1 illustrates that as recently as the 4th quarter of 1986 laboratories participating in the PAT program have not been able to count fibers (chrysotile) with a degree of reproducibility which even closely approaches the NIOSH intra-laboratory data at low filter loadings.

It is of interest to note that the performance limits for each sample show a wide range of acceptable results. This indicates a relatively low degree of reproducibility between proficient laboratories. For instance, sample #1, which had a fiber loading of 187 f/sqmm had acceptable limits ranging from 66 to 368 f/sqmm. Even with these wide limits, 73 out of 594 participating laboratories reported results which were considered outliers -- that is outside of the acceptable range.

NIOSH has established that the results from fiber counting follow a square-root normal distribution--that is, the square-root of the results reported by different labs have a bell shaped curve. Using the equation shown in Figure 2, we have calculated the coefficients of variation (CV) for the last 13 PAT rounds (1984 through 1987). This involved 52 duplicate asbestos samples analyzed by 500-600 labs over the last three years (the time period during which the improved methodology recommended by NIOSH in 1984 was being implemented). Figure 3 shows the results of these calculations. We have plotted the calculated CVs against the corresponding filter loadings, together with the "best-fit" curve through the points. As might be expected, the data indicate that CV increases as the concentration of asbestos fibers on the filters decreases, rising steeply as the limit of detection (lower boundry) is approached.

At a filter loading of 100-125 f/sqmm, five percent of the proficient laboratories would report results which differ from

the mean by plus 153% or minus 83%. In other words, out of 100 proficient labs, 2 would report results of 17 f/sqmm or less and 2 would report results of 253 f/sqmm or greater at a filter loading of 100 f/sqmm.

Even at higher filter loadings, the results from different laboratories are highly variable, as shown in Figure 4. In this figure we show the theoretical probability curve for the distribution of results around a mean result of 500 f/sqmm of filter, assuming a square-root normal distribution with a CV of 15%, as derived from the previous figure. Because of the square-root normal distribution, the curve is somewhat skewed and shows a tail extending to the right (higher results). The square-root distribution, together with the relatively high CV value, indicates that 5% of proficient laboratories will report results which differ from the mean by plus 70% or minus 51%. Returning to Figure 3, this high degree of variability becomes even worse as the mean filter loading is lowered, due to the increasing CV.

Based on the information presented in Figure 3 and the previous discussion which shows the variability of data at filter loadings of 100 and 500 f/sqmm, it can be observed that the coefficient of variation begins to sharply increase at filter loadings lower than 200 f/sqmm.

These data show that a filter loading of 200 f/sqmm represents the lowest practical limit for obtaining reasonably reproducible results between laboratories. For an 8 hour sample, collected on a 25 millimeter filter at a flow rate of 2 liters per minute (the maximum flow rate which can normally be obtained with a battery operated pump), the lowest airborne concentration of asbestos which will provide a minimum filter loading of 200 f/sqmm is 0.08 f/cc of air.

Hence, the current OSHA PEL of 0.2 f/cc and action level of 0.1 f/cc are already "pushing the limits" of presently available sampling and analytical methodology. Until either sampling or analytical methods are improved, this PEL cannot be decreased without losing all semblance of the inter-laboratory reproducibility which is required in the regulatory environment.

The Commission is considering implementation of a Short Term Exposure Limit (STEL). It can be calculated that the STEL for a 15 minute exposure cannot be lower than 2.5 f/cc, in order to attain the minimum filter loading and in order to obtain a reasonably reproducible result.

This analysis does not address the ability of laboratory technicians to make specific fiber identification.

FIGURE 1: PROFICIENCY ANALYTICAL TESTING (PAT) PROGRAM ROUND 87 RESULTS - ASBESTOS

SAMPLE NO.	REFERENCE (MEAN)VALUE, FIBERS/mm²	PERFORMANCE LIMITS		NUMBER OF LABORATORIES	OUTLIERS		
		LOWER	UPPER		HIGH	LOW	TOTAL(%)
1	186.8	66.4	368.2	594	41	32	73(12)
2	646.1	183.3	1,391.2	594	9	22	31(5)
3	720.9	279.2	1,368.2	594	9	33	42(7)
4	396.4	158.5	741.4	594	12	37	49(8)

$$C.V. = \frac{\sqrt{\text{Upper Limit}} - \sqrt{\text{Ref. Mean}}}{3 \times \sqrt{\text{Ref. Mean}}} \times 100$$

FIGURE 2: CALCULATION OF COEFFICIENTS OF VARIATION FROM PAT DATA

FIGURE 3: INTERLABORATORY COUNTING VARIABILITY VS. FILTER LOADING

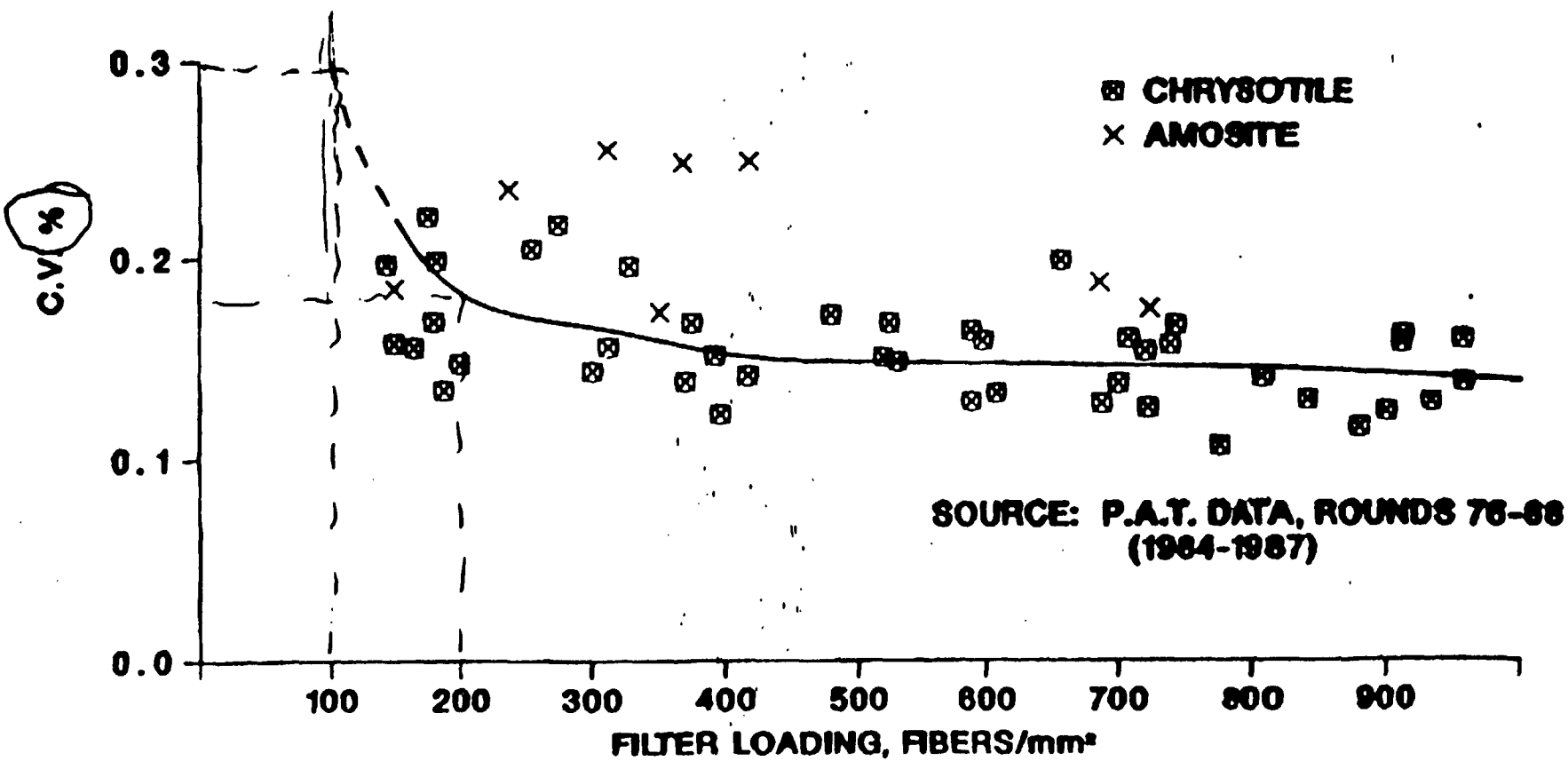

FIGURE 4: INTERLABORATORY VARIABILITY: REPORTED FILTER LOADING VS. PROBABILITY - SQUARE-ROOT NORMAL DISTRIBUTION