

OSHA SAMPLING DATA SHEET #7a

Substance:

Vinyl chloride.

Standard: 29 CFR 1910.93q, permanent standard of October 4, 1974

1. Limits of exposure:

- | | |
|--|--------|
| a. 8 hour time weighted average (TWA) | 1 ppm |
| b. 15 minute ceiling average | 5 ppm |
| c. 15 minute ceiling for those electing
not to wear respirators | 25 ppm |

2. Action level: 8 hour TWA 0.5 ppm

Sampling Equipment:

A calibrated personal sampling pump whose flow rate at 50 ml/min is accurate within $\pm 5\%$ and activated coconut shell tubes containing two sections of 20/40 mesh activated charcoal separated by a 2-mm portion of urethane foam.

Qualifications:

Samples shall be collected only by or under the direction of Compliance Safety and Health Officers (CSHOs) who are Industrial Hygienists.

Sampling Rate:

50 ml/min for all samples

Sample Size:

1. TWA samples:

- a. 5 liter maximum at concentrations below 200 ppm;
maximum duration 100 min.
- b. 2 liter maximum at concentrations above 200 ppm;
maximum duration 40 minutes.

NOTE: In some cases it may be necessary to estimate the vinyl chloride concentration with a portable direct reading instrument to determine the proper volume of air to sample.

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2. Ceiling average samples:

750 milliliters; 15 min. duration

There should be no variation from 15 minutes unless the variation is justifiable.

Sampling Procedure:

- (1) Employee exposures are determined by collecting air samples from a worker's breathing zone using personal samplers.
- (2) TWA 8-hour average exposures are determined by collecting a series of consecutive personal air samples that completely cover the duration of exposure in the 8-hours.
- (3) Fifteen minute ceiling average exposures are determined by collecting full 15 minute period personal air samples.
- (4) Which employee exposures to measure may be determined by screening the concentration of vinyl chloride in the workplace area with a direct reading instrument.
- (5) Immediately before sampling, both ends of two charcoal tubes are broken so as to provide openings at least one-half the internal diameter of the tubes.
- (6) The first charcoal tube is positioned in the tube holder with the smaller backup section of charcoal being positioned nearest the pump. The second charcoal tube serves as a breakthrough indicator and is connected with a small, i.e 0.5 inch, piece of Tygon tubing to the outlet of the plastic charcoal tube holder with the smaller section of charcoal being positioned nearest the pump and connected to the main sample line leading to the pump. Both tubes must be in a vertical position during sampling to avoid channeling and subsequent premature breakthrough of vinyl chloride.
- (7) Air being sampled must not be passed through any hose or tubing before entering the first charcoal tube.
- (8) Set the flow rate at approximately 50 ml/min and record the initial counter number. Sample for an appropriate amount of time and record the final counter number. The sample volume is obtained by multiplying the number of counter strokes times the cc/stroke factor. Record the date, location, temperature, pressure and the tube number.

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- (9) Immediately after sample collection separate the sample tube from the backup tube and cap the tubes with the supplied plastic caps. Put a sample seal on each tube and label the tubes with matching numbers. Designate the sample tube by the letter "S" and the backup tube by the letters "BU". For example, the tubes used to collect the first sample of the day would be labeled 1-S and 1-BU.
- (10) Include one blank charcoal tube with every 20 samples (or one with each lot of samples if less than 20 samples are taken). Handle the blank in the same fashion as the others with the exception that no sample is collected on it. The ends are broken and the tube is immediately capped and prepared for shipping. Label the tube as a blank. The backup tubes are not to be considered as blanks.

Analytical Procedure:

Vinyl chloride is desorbed from activated coconut shell charcoal with carbon disulfide and analyzed using a gas chromatograph with a flame ionization detector. The primary charcoal tube is analyzed as the sample (both front and back sections together) and the backup charcoal tube is analyzed as the breakthrough indicator.

Minimum to be Reported:

0.25 ppm

NOTE: Lesser concentrations will be reported as less than 0.25 ppm, except where none is detected it will be reported as "none detected".

Special Considerations:

- (1) Do not ship bulk samples of polyvinyl chloride or copolymers of vinyl chloride to the laboratory for VC analysis. Our procedure deals with airborne VC.
- (2) Where two or more compounds are known or suspected to be present in the air, transmit this information, including their suspected identities, with the sample to the laboratory.
- (3) The sampling places a heavy load on the sampling pump due to the high resistance of two charcoal tubes in series. Therefore, do not operate the pumps more than 8 hours continuously without fully recharging the battery.

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- (4) The presence of high humidity or water mist causes a reduction in breakthrough volume. However, this has been taken into account and as long as the specified maximum sample size is not exceeded, no breakthrough should occur.
- (5) The desorption efficiency of charcoal can vary from batch to batch. Therefore, all the tubes used to collect a set of samples should contain charcoal from the same batch. Record the charcoal lot number on the sample seal.
- (6) The increased pressure drop of two tubes in series will cause the cc/stroke factor to change. Also this cc/stroke factor, at this high pressure drop, will vary slightly with flow rate. Therefore, for this special sampling situation, the pumps must be calibrated at a flow rate in the vicinity of 50 ml/min with two charcoal tubes in line ahead of the pump and a corresponding cc/stroke factor determined. When sampling for vinyl chloride use only the flow control setting that corresponds to the flow rate in the vicinity of 50 ml/min as determined from this calibration.

Shipping Instructions

Ship samples in a mailing tube. Mark it "RUSH" and send it "AIR MAIL."

The CSHO should make every effort to forward the samples to the laboratory by the morning following the day the samples are collected. It is imperative that the laboratory receive the samples soon enough to complete the analyses within 96 hours after sample collection. Pre-planning is necessary.

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Vinyl Chloride: Questions and Answers

Almost everything you always wanted to know about OSHA's vinyl chloride standard but were afraid to ask

JOB SAFETY AND HEALTH MAGAZINE APRIL 1975

"In the average year approximately 150 people are struck by lightning. Last year 32 cases of vinyl chloride-related cancer were discovered. In view of these numbers, should not workers be required to carry a lightning rod?"

Not every question OSHA gets asked about its vinyl chloride (VC) standard is as frivolous as this one from an anonymous user of polyvinyl chloride (PVC) resin. In fact, now that an appeals court has ruled the standard is effective April 1, 1975, hundreds of legitimate questions—the ones that get down to the nitty-gritty of how to comply in each plant—are rolling in. Here we offer OSHA's replies to some of the most frequently asked questions.

For more general information on the VC standard, check JOB SAFETY & HEALTH, January 1975. If you have further questions, write to: OSHA Regional Programs, Division of Occupational Health Programming, Room 760, 1726 M St., NW, Washington, D.C. 20210.

Q. *We know that the standard requires an initial monitoring program to tell if an employee is exposed above the action level of 0.5 ppm. Do we have to monitor VC exposures for every single employee?*

A. Each employee need not be personally monitored, but your monitoring must take into account all employees—whether they wear respirators or not—and must give a valid determination of employee exposures.

You might select representative employees for personal monitoring according to these criteria: the number of employees per shift, their duties, work areas and operations, and work practices in force. Each employee's VC exposure must be represented even though he may not be personally monitored.

Q. *How soon after the standard goes into effect must the initial monitoring be done?*

A. Where a process is already in operation, monitoring must be accomplished and regulated areas established by April 1, 1975. We recommend that new processes be monitored within one week after start-up and regulated areas established as soon as possible after the monitoring results are available.

Q. *We use PVC, but extensive monitoring has shown that VC concentrations are below the permissible limit—one ppm as a time-weighted average and five ppm as a ceiling. Do we have to establish a "regulated area?" What if concentrations are below the "action level" of 0.5 ppm?*

A. The standard sets two conditions, both of which must be met before a regulated area is required:

- 1) VC or PVC is manufactured, reacted, packaged, repackaged, stored, handled, or used.
- 2) VC concentrations are in excess of the permissible exposure limit.

If concentrations, then, are below either the permissible limit or the action level, you do not have to set up a regulated area.

Q. *Does every employee in our plant who with VC have to be given training? What about the employees exposed below the action level?*

A. There are no exceptions to the training requirement. Regardless of how low the monitoring results are, each employee "engaged in VC or PVC operations" must be given training in the hazards related to VC and the proper precautions for using it. This might include maintenance, laboratory, and supervisory personnel as well as production workers.

Q. *Occasionally our company uses what we consider temporary employees. These*

people would be exposed above the action level for no more than two weeks a year. Must we provide them with medical exams required by the standard?

A. If the workers are exposed above the action level and if they are your employees, you are respon-

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film, sometimes cutting it with a hot wire. According to the OSHA standard, what should our company be doing to protect me?

A. Meat packaging films are considered a "fabricated product" under the OSHA standard since mass melting does not occur when they are cut with the hot wire. Consequently, the packaging operation you describe is not covered by the VC standard.

NIOSH has conducted research into the possible release of VC during PVC packaging operations and, using instruments sensitive to approximately one ppm, has not detected any VC. However, NIOSH has determined that when heated, PVC film decomposes into hydrogen chloride and carbonaceous gases. The hydrogen chloride gas, which becomes hydrochloric acid on contact with the mucous membranes of the eyes, throat, and nasal passages, can be irritating at concentrations above the OSHA standard of five ppm for hydrogen chloride. So far NIOSH has found no health hazards from exposure to other PVC decomposition products, though the investigation is continuing.

Q. The standard says that it applies to the transportation of VC or PVC "except to the extent that the Department of Transportation (DOT) may regulate the hazards." Are the placards DOT requires for tank trucks carrying VC monomer enough to fulfill the labeling requirements of the standard? If not, what is meant by the requirement that labeling be "legible?" Is a tank truck on the road considered a "regulated area?" If the driver does not help in loading or unloading, is he covered by any of the provisions of the standard?

A. There need not be duplication of DOT markings that cover such hazards as flammability. However, markings not required by DOT, such as "cancer-suspect agent," must be part of the container label. In other words, when placarding specified by DOT is not sufficient to meet requirements outlined in the OSHA standard, additional labeling will be required.

For working purposes, we define "legible" as the same size lettering as other emergency or warning instructions on the side of the container or vehicle.

A tank truck carrying VC would be considered a regulated area only if it were expected (based on measurements or other known facts) that VC concentrations would exceed one ppm as an eight-hour time-weighted average or five ppm as a ceiling. It appears unlikely that a truck on the road would be in this situation.

Whether the truck driver is covered depends on the amount of VC he is exposed to. If the exposure is below the action level of 0.5 ppm—as seems likely—only the training and labeling provisions of the standard would apply.

Q. We are expecting shipments of PVC resin after the

standard goes into effect. The resin is shipped in sealed containers 20 and 40 feet long. How will the standard affect our operation?

A. The OSHA standard does not prohibit importing VC or PVC, but each employer is responsible for knowing the working conditions of his employees and controlling conditions to meet the standard's requirements.

Our information on VC exposure levels in handling packaged resins is limited. Concentrations above the exposure limit have been measured in warehouses where PVC resin is stored. Freshly opened containers, particularly air-tight ones, may release significant amounts of VC to the air. For instance, concentrations in trucks loaded with bagged PVC resin have been measured at 200 to 600 ppm.

It appears that, at the very least, you must do initial monitoring of employee exposures. If the eight-hour time-weighted average is below 0.5 ppm and 15-minute exposures below five ppm, then your duties are reduced basically to labeling containers and training employees.

Q. The standard says that no employee can be exposed to VC concentrations above five ppm over a 15-minute period. What about those employees who decide not to wear a respirator for the standard's first year?

A. Before April 1, 1976, the ceiling exposure limit of five ppm over 15 minutes does not apply to the employees who have elected not to wear respirators. They may be exposed to as much as 25 ppm over any 15-minute period.

Q. The emergency provisions of the standard go into effect when you have a "massive release" of VC. Exactly how much VC does it take to trigger these provisions?

A. We define a "massive release" as any operation or place where the VC concentration is greater than 100 ppm. For example, a broken pipe in a PVC plant might cause a massive release.

Q. The standard says that no employees may have direct contact with VC. What do you mean by "direct contact?"

A. Skin contact with liquid VC.

Q. The standard requires us to keep a daily roster of authorized persons who enter a regulated area. What information should we include on the roster?

A. The daily roster should consist of legible signatures—or printed or typed names—and social security numbers of authorized persons. Illegible names or numbers on the roster sheet will be considered as failure to keep a bona fide log. These rosters must be kept for 30 years.