

Once a year mandatory briefing

*ED-10
VCM Training*

ETHYL CORPORATION

INTER OFFICE
CORRESPONDENCE

TO: DIRECTOR

ADDRESS

FROM: J. E. Mackie

ADDRESS: Richmond

SUBJECT: Vinyl Chloride Standard

DATE: February 8, 1980

This is to remind you the Vinyl Chloride Standard (OSHA 1910:1017) calls for an annual training session as well as a review of the standard with each employee engaged in vinyl chloride or polyvinyl chloride operations.

Our records show you should have this review completed by the 30th of March 1980. If you wish you may use the attached shorter version that was prepared by Corporate Medical with the thought of reducing time consumed in the training session but still giving essential facts. Please inform me when you have completed the sessions.

J. E. Mackie
J. E. Mackie

CC: Also

- J. Greer (Chippewale)
- A. M. Smith (Sambrook)
- T. J. Smith (Chippewale)
- J. M. Smith (Bedford Heights)
- V. M. Smith (Brookline Heights)
- E. Paton (Garrettsville)
- C. R. Bailey (Richmond)
- C. W. Montgomery (PRT)
- R. E. McKenzie (Richmond)
- S. R. Smith (Bedford Heights)
- J. M. Palmer (Richmond)

*Please show them
the short on way
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INFORMATION ABOUT POLYVINYL CHLORIDE

Many employees in this plant work with polyvinyl chloride, a widely used and very useful plastic. Polyvinyl chloride, usually known as PVC is used for auto seats and roofs, liners for disposable diapers, for wrapping meat, for water pipe and thousands of other things, including the bottles made by *Brookway-Imco*.

In early 1974, as many of you know, several cases of a very rare liver tumor called angiosarcoma were discovered among long-time employees of a plant making PVC in Louisville. Since then, 3 other vinyl chloride-polyvinyl chloride manufacturing facilities in the United States have discovered cases of these rare tumors. In all, 48 such cases, occurring over the past 20 years, have now been found worldwide among employees of VCM-PVC manufacturing facilities. All the cases that have occurred have been in plants manufacturing the gas - vinyl chloride - or making it into the plastic - PVC to make pipe, bottles, film or the many other things made from PVC.

Because of the concern caused by the discovery of these liver tumors (angiosarcoma), in the Fall of 1974 the Labor Department's Occupational Safety and Health Administration (OSHA) issued emergency rules to protect workers from vinyl chloride (VCM). These rules are now permanent. Although designed primarily for workers in the plants making VCM and PVC, they apply to all workers who may be exposed to vinyl chloride, including those in lubricating plants, such as ours.

Most PVC resins contain small amounts of the vinyl chloride monomer (VCM) trapped in the resin when it is made. During the last two years, new manufacturing techniques have been developed to reduce the VCM

remaining in the resin. Where once the VCM might have been 100 parts per million (ppm) of resin or even higher, for the most part our resins now have one ppm or less of the monomer.

OSHA requires that workers exposed to more than 1 ppm of airborne VCM must wear respirators. By reducing the amount of VCM in the resin, our measurements indicate that it is not necessary for anyone in this plant to wear a mask in order to limit exposure to airborne VCM. The air concentrations are well below the required limit.

OSHA has established other rules of interest to all of us. These include:

- (1.) All resin barrels and hopper cars must be labeled in accordance with OSHA regulations.
- (2.) The presentation made to you now, must be made to all employees including new hires, and reviewed annually thereafter.
- (3.) We are required to have measured the amount of VCM in the air here. You are entitled to know the results of this monitoring.
- (4.) The regulation establishing a "action level" of 0.5 parts per million (ppm) of VCM in the air is entitled to be followed. This level is established by OSHA as a "action level" and, therefore, we do not require continuous monitoring the air unless there is some reason to believe that exposure has increased.
- (5.) If at any time the plant reached an exposure level above the one part per million limit we would be required a "regulated area" with warning signs and only authorized personnel would be permitted to enter the "regulated area". If we are ever in excess

of the permissible level you will be told and other work rules would take effect. It is essential that you follow the work practices that we would have to set up to comply with the new OSHA regulations. As with all other safety rules, never take short cuts that may endanger your health.

Remember no area in the plant comes close to exceeding this level, therefore, none of these special regulations will be necessary. We have complete copies of the regulations should you be interested in reading them.

POINTS TO REMEMBER

Our exposure here is lower than the very strict limits set by the government.

Only a small amount of free monomer is contained in the resins used here and efforts are being made to reduce this even further.

The OSHA Standards are extremely complicated and have but one purpose--employee protection from adverse health effects of Vinyl Chloride Monomer.

Observe all safety rules, especially any new rules if they are ever put into effect, because a healthful environment for employees requires our total team effort.

Assistant Secretary or the Director, and, upon request, an employee or former employee, to a physician designated by the employee or to a new employer.

(iii) Any physician who conducts a medical examination required by this paragraph shall furnish to the employer a statement of the employee's suitability for employment in the specific exposure.

[Secs. 1910.1013-1910.1016 added at 39 FR 3755, January 24, 1974, effective February 11, 1974]

§ 1910.1017 Vinyl chloride.

(a) *Scope and application.* (1) This section includes requirements for the control of employee exposure to vinyl chloride (chloroethene), Chemical Abstracts Service Registry No. 75014.

[Section 1910.934, (1) amended at 39 FR 41848, December 3, 1974; 1910.934 was redesignated as 1910.1017 at 40 FR 23072, May 28, 1975]

(2) This section applies to the manufacture, reaction, packaging, repackaging, storage, handling or use of vinyl chloride or polyvinyl chloride, but does not apply to the handling or use of fabricated products made of polyvinyl chloride.

(3) This section applies to the transportation of vinyl chloride or polyvinyl chloride except to the extent that the Department of Transportation may regulate the hazards covered by this section.

(b) *Definitions.* (1) "Action level" means a concentration of vinyl chloride of 0.5 ppm averaged over an 8-hour work day.

(2) "Assistant Secretary" means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or his designee.

(3) "Authorized person" means any person specifically authorized by the employer whose duties require him to enter a regulated area or any person entering such an area as a designated representative of employees for the purpose of exercising an opportunity to observe monitoring and measuring procedures.

(4) "Director" means the Director, National Institute for Occupational Safety and Health, U.S. Department of Health, Education, and Welfare, or his designee.

(5) "Emergency" means any occurrence such as, but not limited to, equipment failure, or operation of a relief device which is likely to, or does, result in massive release of vinyl chloride.

(6) "Fabricated product" means a product made wholly or partly from polyvinyl chloride, and which does not require further processing at temperatures, and for times, sufficient to cause mass melting of the polyvinyl chloride resulting in the release of vinyl chloride.

(7) "Hazardous operation" means any operation, procedure, or activity where a release of either vinyl chloride liquid or gas might be expected as a consequence of the operation or procedure, or activity, the operation, procedure, or activity, or employee exposure to vinyl chloride in excess of the permissible exposure limit.

[Section 1910.934, (1) amended at 39 FR 41848, December 3, 1974; 1910.934 was redesignated at 40 FR 23072, May 28, 1975]

(8) "SHA Area Director" means the Director for the Occupational Safety and Health Administration Area Office having jurisdiction over the geographic area in which the employer's establishment is located.

(9) "Polyvinyl chloride" means polyvinyl chloride in its polymer or copolymer form before such is converted to a fabricated product.

(10) "Vinyl chloride" means vinyl chloride monomer.

(c) *Permissible exposure limit.* (1) No employee may be exposed to vinyl chloride at concentrations greater than 1 ppm averaged over any 8-hour period, and

(2) No employee may be exposed to vinyl chloride at concentrations greater than 5 ppm averaged over any period not exceeding 15 minutes.

(3) No employee may be exposed to vinyl chloride by direct contact with liquid vinyl chloride.

(d) *Monitoring.* (1) A program of initial monitoring and measurement shall be undertaken in each establishment to determine if there is any employee exposed, without regard to the use of respirators, in excess of the action level.

(2) Where a determination conducted under paragraph (d)(1) of this section shows any employee exposures, without regard to the use of respirators, in excess of the action level, a program for determining exposures for each such employee shall be established. Such a program:

(i) Shall be repeated at least monthly where any employee is exposed, without regard to the use of respirators, in excess of the permissible exposure limit.

(ii) Shall be repeated not less than quarterly where any employee is exposed, without regard to the use of respirators, in excess of the action level.

(iii) May be discontinued for any employee only when at least two consecutive monitoring determinations, made not less than 5 working days apart, show exposures for that employee at or below the action level.

(3) Whenever there has been a production, process or control change which may result in an increase in the release of vinyl chloride, or the employer has any other reason to suspect that any employee may be exposed in excess of the action level, a determination of employee exposure under paragraph (d)(1) of this section shall be performed.

(4) The method of monitoring and measurement shall have an accuracy (within a confidence level of 95 percent) of not less than plus or minus 50 percent from 0.25 through 0.5 ppm, plus or minus 25 percent from over 0.5 ppm through 1.0 ppm, and plus or minus 25 percent over 1.0 ppm. Methods meeting these accuracy requirements are available in the "NIOSH Manual of Analytical Methods".

(5) Employers or their designated representatives shall be afforded reasonable opportunity to observe the monitoring and measurement performed by the employer.

(e) *Regulated area.* (1) A regulated area shall be established where:

(i) Vinyl chloride or polyvinyl chloride is manufactured, reacted, repackaged, stored, handled or used; and

(ii) Vinyl chloride concentrations are in excess of the permissible exposure limit.

(2) Access to regulated areas shall be limited to authorized persons. A duty roster shall be made of authorized persons who enter.

(f) *Methods of compliance.* Employee exposures to vinyl chloride shall be controlled to at or below the permissible exposure limit provided in paragraph (c) of this section by engineering, work practice, and personal protective controls as follows:

(1) Feasible engineering and work practice controls shall immediately be used to reduce exposures to at or below the permissible exposure limit.

(2) Wherever feasible engineering and work practice controls which can be instituted immediately are not sufficient to reduce exposures to at or below the permissible exposure limit, they shall nonetheless be used to reduce exposures to the lowest practicable level, and shall be supplemented by respiratory protection in accordance with paragraph (g) of this section. A program shall be established and implemented to reduce exposures to at or below the permissible exposure limit, or to the greatest extent feasible, solely by means of engineering and work practice controls, as soon as feasible.

(3) Written plans for such a program shall be developed and furnished upon request for examination and copying to authorized representatives of the Assistant Secretary and the Director. Such plans shall be updated at least every six months.

(g) *Respiratory protection.* Where respiratory protection is required under this section:

(1) The employer shall provide a respirator which meets the requirements of this paragraph and shall assure that the employee uses such respirator, except that until April 1, 1976, wearing of respirators shall be at the discretion of each employee for exposures not in excess of 2 ppm, measured over any 15-minute period. Until April 1, 1976, each employee who chooses not to wear an appropriate respirator shall be informed at least quarterly of the hazards of vinyl chloride and the proper use, and limitations of respiratory devices.

[Section 1910.934(g)(1) amended at 40 FR 13211, March 25, 1975; Section 1910.934 was redesignated 1910.1017 at 40 FR 23072, May 28, 1975]

(2) Respirators shall be selected from among those jointly approved by the Mining Enforcement and Safety Administration, Department of the Interior and the National Institute for Occupational Safety and Health under the provisions of 30 CFR Part 11.

(3) A respiratory protection program meeting the requirements of § 1910.1017 shall be established and maintained.

(4) Selection of respirators for vinyl chloride shall be as follows:

Atmospheric concentration of vinyl chloride	Required apparatus
(i) Unknown, or above 3,600 ppm	Open-circuit, self-contained breathing apparatus, pressure demand type, with full facepiece.
(ii) Not over 3,600 ppm	(A) Combination type C supplied air respirator, pressure demand type, with full or half facepiece, and auxiliary self-contained air supply; or (B) Combination Type C, supplied air respirator, continuous flow type, full or half facepiece, and auxiliary self-contained air supply.
(iii) Not over 1,000 ppm	Type C, supplied air respirator, continuous flow type, with full or half facepiece, helmet or hood.
(iv) Not over 100 ppm	(A) Combination type C supplied air respirator demand type, with full facepiece, and auxiliary self-contained air supply; or (B) Open-circuit self-contained breathing apparatus with full facepiece, in demand mode; or (C) Type C supplied air respirator, demand type, with full facepiece.
(v) Not over 25 ppm	(A) A powered air-purifying respirator with hood, helmet, full or half facepiece, and a canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 ppm; or (B) Gas mask, front- or back-mounted canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 ppm.
(vi) Not over 10 ppm	(A) Combination type C supplied-air respirator, demand type, with half facepiece, and auxiliary self-contained air supply; or (B) Type C supplied-air respirator, demand type, with half facepiece; or (C) Any chemical cartridge respirator with an organic vapor cartridge which provides a service life of at least 1 hour for concentrations of vinyl chloride up to 10 ppm.

[Section 1910.93q(4) amended at 39 FR 41848, December 3, 1974, and redesignated as 1910.1017 at 40 FR 23072, May 28, 1975]

(5)(i) Entry into unknown concentrations or concentrations greater than 36,000 ppm (lower explosive limit) may be made only for purposes of life rescue; and

(ii) Entry into concentrations of less than 36,000 ppm but greater than 3,600 ppm may be made only for purposes of life rescue, firefighting, or securing equipment so as to prevent a greater hazard from release of vinyl chloride.

(6) Where air-purifying respirators are used:

(i) Air-purifying canisters or cartridges shall be replaced prior to the expiration of their service life or the end of the shift in which they are first used, whichever occurs first; and

(ii) A continuous monitoring and alarm system shall be provided where concentrations of vinyl chloride could reasonably exceed the allowable concentrations for the devices in use. Such system shall be used to alert employees when vinyl chloride concentrations exceed the allowable concentrations for the devices in use.

(7) Apparatus prescribed for higher concentrations may be used for any lower concentration.

(h) **Hazardous operations.** (1) Employees engaged in hazardous operations, including entry of vessels to clean of vinyl chloride residue from vessel walls, shall be provided and required to wear and use:

(i) Respiratory protection in accordance with paragraphs (c) and (d) of this section; and

(ii) Protective garments to prevent skin contact with liquid vinyl chloride or with polyvinyl chloride residue from vessel walls. The protective garments shall be selected for the operation and its possible exposure conditions.

(3) Protective garments shall be provided clean and dry for each use.

(4) **Emergency situations.** A written operational plan for emergency situations shall be developed for each facility storing, handling, or otherwise using vinyl chloride as a liquid or compressed gas. Appropriate portions of the plan shall be implemented in the event of an emergency. The plan shall specifically provide that:

(1) Employees engaged in hazardous operations or correcting situations of existing hazardous releases shall be equipped as required in paragraph (h) of this section;

(2) Other employees not so equipped shall evacuate the area and not return until conditions are controlled by the methods required in paragraph (f) of this section and the emergency is abated.

(3) **Training.** Each employee engaged in vinyl chloride or polyvinyl chloride operations shall be provided training in a program relating to the hazards of vinyl chloride and precautions for its safe use.

(i) The program shall include:

(1) The nature of the health hazard from chronic exposure to vinyl chloride including specifically the carcinogenic hazard;

(2) The specific nature of operations which could result in exposure to vinyl

chloride in excess of the permissible limit and necessary protective steps;

(iii) The purpose for, proper use, and limitations of respiratory protective devices;

[Section 1910.93q(j)(1)(iii) amended at 39 FR 41848, December 3, 1974, and redesignated as 1910.1017 at 40 FR 23072, May 28, 1975]

(iv) The fire hazard and acute toxicity of vinyl chloride, and the necessary protective steps;

(v) The purpose for and a description of the monitoring program;

(vi) The purpose for, and a description of, the medical surveillance program;

(vii) Emergency procedures;

(viii) Specific information to aid the employee in recognition of conditions which may result in the release of vinyl chloride; and

(ix) A review of this standard at the employee's first training and indoctrination program, and annually thereafter.

(2) All materials relating to the program shall be provided upon request to the Assistant Secretary and the Director.

(k) **Medical surveillance.** A program of medical surveillance shall be instituted for each employee exposed, without regard to the use of respirators, to vinyl chloride in excess of the action level. The program shall provide each such employee with an opportunity for examinations and tests in accordance with this paragraph. All medical examinations and procedures shall be performed by or under the supervision of a licensed physician, and shall be provided without cost to the employee.

(1) At the time of initial assignment, or upon institution of medical surveillance:

(i) A general physical examination shall be performed, with specific attention to detecting enlargement of liver, spleen or kidneys, or dysfunction in these organs, and for abnormalities in skin, connective tissues and the pulmonary system (See Appendix A).

(ii) A medical history shall be taken, including the following topics:

(A) Alcohol intake;

(B) Past history of hepatitis;

(C) Work history and past exposure to potential hepatotoxic agents, including drugs and chemicals;

(D) Past history of blood transfusions; and

(E) Past history of hospitalizations.

(iii) A serum specimen shall be obtained and determinations made of:

(A) Total bilirubin;

(B) Alkaline phosphatase;

(C) Serum glutamic oxalacetic transaminase (SGOT);

(D) Serum glutamic pyruvic transaminase (SGPT); and

(E) Gamma glutamyl transpeptidase.

(2) Examinations provided in accordance with this paragraph shall be performed at least:

(i) Every 6 months for each employee who has been employed in vinyl chloride or polyvinyl chloride manufacturing for 10 years or longer; and

(ii) Annually for all other employees.

(3) Each employee exposed to an emergency shall be afforded appropriate medical surveillance.

(4) A statement of each employee's suitability for continued exposure to vinyl chloride including use of protective equipment and respirators, shall be obtained from the examining physician promptly after any examination. A copy of the physician's statement shall be provided each employee.

(5) If any employee's health would be materially impaired by continued exposure, such employee shall be withdrawn from possible contact with vinyl chloride.

(6) Laboratory analyses for all biological specimens included in medical examinations shall be performed in laboratories licensed under 42 CFR Part 74.

(7) If the examining physician determines that alternative medical examinations to those required by paragraph (k)(1) of this section will provide at least equal assurance of detecting medical conditions pertinent to the exposure to vinyl chloride, the employer may accept such alternative examinations as meeting the requirements of paragraph (k)(1) of this section, if the employer obtains a statement from the examining physician setting forth the alternative examinations and the rationale for substitution. This statement shall be available upon request for examination and copying to authorized representatives of the Assistant Secretary and the Director.

(l) *Signs and labels.* (1) Entrances to regulated areas shall be posted with legible signs bearing the legend:

**CANCER-SUSPECT AGENT AREA
AUTHORIZED PERSONNEL ONLY**

[Section 1910.93q (l) (1) amended at 39 FR 41848, December 3, 1974 and redesignated as 1910.1017 at 40 FR 23072, May 28, 1975]

(2) Areas containing hazardous operations or where an emergency currently exists shall be posted with legible signs bearing the legend:

**CANCER-SUSPECT AGENT IN THIS AREA
PROTECTIVE EQUIPMENT REQUIRED
AUTHORIZED PERSONNEL ONLY**

[Section 1910.93q (l)(2) amended at 39 FR 41848, December 3, 1974 and redesignated as 1910.1017 at 40 FR 23072, May 28, 1975]

(3) Containers of polyvinyl chloride resin waste from reactors or other waste contaminated with vinyl chloride shall be legibly labeled:

**CONTAMINATED WITH
VINYL CHLORIDE
CANCER-SUSPECT AGENT**

[Section 1910.93q (l) (3) amended at 39 FR 41848, December 3, 1974 and redesignated as 1910.1017 at 40 FR 23072, May 28, 1975]

(4) Containers of polyvinyl chloride shall be legibly labeled:

**POLYVINYL CHLORIDE (OR TRADE NAME)
CONTAINS**

VINYL CHLORIDE

VINYL CHLORIDE IS A CANCER-SUSPECT AGENT

(5) Containers of vinyl chloride shall be legibly labeled either:

(i) **VINYL CHLORIDE
EXTREMELY FLAMMABLE GAS UNDER PRESSURE
CANCER-SUSPECT AGENT**

or (ii) In accordance with 49 CFR Parts 170-189, with the additional legend:

CANCER-SUSPECT AGENT

applied near the label or placard.
[Section 1910.93q (l) (5) (ii) amended at 39 FR 41848, December 3, 1974 and redesignated as 1910.1017 at 40 FR 23072, May 28, 1975]

(6) No statement shall appear on or near any required sign, label or instruction which contradicts or detracts from the effect of, any required warning, information or instruction.

(m) *Records.* (1) All records maintained in accordance with this section shall include the name and social security number of each employee where relevant.

(2) Records of required monitoring and measuring, medical records, and authorized personnel rosters, shall be made and shall be available upon request for examination and copying to authorized representatives of the Assistant Secretary and the Director.

(i) Monitoring and measuring records shall:

(A) State the date of such monitoring and measuring and the concentrations determined and identify the instruments and methods used;

(B) Include any additional information necessary to determine individual employee exposures where such exposures are determined by means other than individual monitoring of employees; and

(C) Be maintained for not less than 30 years.

(ii) Authorized personnel rosters shall be maintained for not less than 30 years.

(i.i) Medical records shall be maintained for the duration of the employment of each employee plus 20 years, or 30 years, whichever is longer.

(3) In the event that the employer ceases to do business and there is no successor to receive and retain his records for the prescribed period, these records shall be transmitted by registered mail to the Director, and each employee individually notified in writing of this transfer.

(4) Employees or their designated representatives shall be provided access to examine and copy records of required monitoring and measuring.

(5) Former employees shall be provided access to examine and copy re-

quired monitoring and measuring records reflecting their own exposures.

(6) Upon written request of any employee, a copy of the medical record of that employee shall be furnished to any physician designated by the employee.

(n) *Reports.* (1) Not later than 1 month after the establishment of a regulated area, the following information shall be reported to the OSHA Area Director. Any changes to such information shall be reported within 15 days.

(i) The address and location of each establishment which has one or more regulated areas; and

(ii) The number of employees in each regulated area during normal operations, including maintenance.

(2) Emergencies, and the facts obtainable at that time, shall be reported within 24 hours to the OSHA Area Director. Upon request of the Area Director, the employer shall submit additional information in writing relevant to the nature and extent of employee exposures and measures taken to prevent future emergencies of similar nature.

(3) Within 10 working days following any monitoring and measuring which discloses that any employee has been exposed, without regard to the use of respirators in excess of the permissible exposure limit, each such employee shall be notified in writing of the results of the exposure measurement and the steps being taken to reduce the exposure to within the permissible exposure limit.

[Section 1910.93q (n) (3) amended at 39 FR 41848, December 3, 1974; Section 1910.93q was redesignated 1910.1017 at 40 FR 23072, May 28, 1975]

(o) *Effective dates.* (1) Until April 1, 1975, the provisions currently set forth in Sec. 1910.93q of this Part shall apply. [Ed. note: This paragraph refers to the emergency temporary standard published at 39 FR 12343]

(2) Effective April 1, 1975, the provisions set forth in Sec. 1910.93q of this Part shall apply.

[Section 1910.93q(o)(1) and (2) amended at 40 FR 13211, March 25, 1975; Section 1910.93q was redesignated 1910.1017 at 40 FR 23072, May 28, 1975]

APPENDIX A—SUPPLEMENTAL MEDICAL INFORMATION

When required tests under paragraph (k)(1) of this section show abnormalities, the tests should be repeated as soon as practicable, preferably within 3 to 4 weeks. If tests remain abnormal, consideration should be given to withdrawal of the employee from contact with vinyl chloride, while a more comprehensive examination is made.

Additional tests which may be useful:
A. For kidney dysfunction: urine examination for albumin, red blood cells, and exfoliative abnormal cells.

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[Sec. 1910.1017 (Appendix A)]

B. Pulmonary system: Forced vital capacity, Forced expiratory volume at 1 second, and chest roentgenogram (posterior-anterior, 14 x 17 inches).

C. Additional serum tests: Lactic acid dehydrogenase, lactic acid dehydrogenase isoenzyme, protein determination, and protein electrophoresis.

D. For a more comprehensive examination on repeated abnormal serum tests: Hepatitis B antigen, and liver scanning. (Secs. 6 and 8, 84 Stat. 1598, 1599 (29 U.S.C. 655, 657); Secretary of Labor's Order No. 12-71, 36 FR 8754)

[Section 1910.93q added at 39 FR 12343, April 5, 1974, as emergency temporary standard; issued as permanent standard at 39 FR 35896, October 4, 1974; Section 1910.93q was redesignated 1910.1017 at 40 FR 23072, May 28, 1975]

§ 1910.1028 Benzene.

(a) *Scope and application.* (1) This section applies to each place of employment where benzene is produced, reacted, released, packaged, repackaged, stored, transported, handled, or used.

(2) This section does not apply to:

(i) The storage, transportation, distribution, dispensing, sale or use as fuel of gasoline, motor fuels, or other fuels subsequent to discharge from bulk terminals; or

(ii) The storage, transportation, distribution or sale of benzene in intact containers sealed in such a manner as to contain benzene vapors or liquid, except for the requirements of paragraph (k) (2), (3), (4), and (5), and paragraph (j) of this section.

(b) *Definitions.* "Action level" means an airborne concentration of benzene of 0.5 ppm, averaged over an 8-hour work day.

"Assistant Secretary" means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

"Authorized person" means any person required by his duties to enter a regulated area and authorized to do so by his employer, by this section or by the Occupational Safety and Health Act of 1970. "Authorized person" includes a representative of employees who is designated to observe monitoring and measuring procedures under paragraph (m) of this section.

"Benzene" (C₆H₆) (CAS Registry No. 00071432) means solid, liquefied or gaseous benzene. It includes mixtures of liquids containing benzene and the vapors released by these liquids.

"Bulk terminal" means a facility which is used for the storage and distribution of gasoline, motor fuels or other fuels and which receives its petroleum products by pipeline, barge or marine tanker.

"Director" means the Director of the National Institute for Occupational Safety and Health, U.S. Department of Health, Education, and Welfare, or designee.

"Emergency" means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which may, or does, result in a massive release of benzene.

"OSHA Area Office" means the office of the Occupational Safety and Health Administration having jurisdiction over the geographic area where the affected workplace is located.

(c) *Permissible exposure limits.*—(1) *Inhalation.*—(i) *Time-weighted average limit (TWA).* The employer shall assure that no employee is exposed to an airborne concentration of benzene in excess of 1 part benzene per million parts of air (1 ppm) as an 8-hour time-weighted average.

(ii) *Ceiling limit.* The employer shall assure that no employee is exposed to an airborne concentration of benzene in excess of 5 ppm as averaged over any 15 minute period.

(2) *Dermal and eye exposure limit.* The employer shall assure that no employee is exposed to eye contact with liquid benzene; or to skin contact with liquid benzene, unless the employer can establish that the skin contact is an isolated instance.

(d) *Regulated areas.* (1) The employer shall establish, within each place of employment, regulated areas where benzene concentrations are in excess of the permissible airborne exposure limit.

(2) The employer shall limit access to regulated areas to authorized persons.

(3) *Notification of regulated areas.* Within 30 days following the establishment of a regulated area, the employer shall report the following information to the OSHA Area Office:

(i) The address of each establishment which has one or more regulated areas;

(ii) The locations, within the establishment, of each regulated area;

(iii) A brief description of each process or operation which results in employee exposure to benzene in regulated areas; and

(iv) The number of employees engaged in each process or operation within each regulated area which results in exposure to benzene, and an estimate of the frequency and degree of exposure within each regulated area.

(e) *Exposure monitoring and measurements.*—(1) *General.* (i) Determinations of airborne exposure levels

shall be made from air samples that are representative of each employee's exposure to benzene over an eight (8) hour period.

(ii) For the purposes of this section, employee exposure is that exposure which could occur if the employee were not using a respirator.

(2) *Initial monitoring.* (i) Each employer, who has a place of employment where benzene is produced, reacted, released, packaged, repackaged, stored, transported, handled or used shall monitor each of these workplaces and work operations to accurately determine the airborne concentrations of benzene to which employees may be exposed.

(ii) The initial monitoring required under paragraph (e)(2)(i) of this section shall be conducted and the results obtained within 30 days of the effective date of this section. Where the employer has monitored after January 4, 1977 and the monitoring satisfies the accuracy requirements of paragraph (e)(6) of the section, the employer may rely on such earlier monitoring to satisfy the requirements of paragraph (e)(2)(i) of this section, unless there has been a production, process, personnel or control change which may have resulted in new or additional exposures to benzene or the employer has any other reason to suspect a change which may have resulted in new or additional exposures to benzene; and provided that the employer maintains a record of the monitoring in accordance with paragraph (i)(1) and notifies each employee in accordance with paragraph (e)(5).

(3) *Frequency.*—(i) *Measurements below the action level.* If the measurements conducted under paragraph (e)(2)(i) of this section reveal employee exposure to be below the action level, the measurements need not be repeated, except as otherwise provided in paragraph (e)(4) of this section.

(ii) *Measurements above the action level.* If the measurements reveal employee exposure to be in excess of the action level, but below the permissible exposure limit, the employer shall repeat the monitoring at least quarterly. The employer shall continue these quarterly measurements until at least two consecutive measurements, taken at least seven (7) days apart, are below the action level, and thereafter the employer may discontinue monitoring, except as provided in paragraph (e)(4) of this section.

(iii) *Measurements above the permissible exposure limit.* If the measurements reveal employee exposure to be in excess of the permissible exposure limits, the employer shall repeat the

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