

VINYL CHLORIDE

Compressed, liquefied gas; sweet odor. Gas is heavier than air.

HAZARDS (CANCER SUSPECT AGENT)

FIRE

Extremely flammable. May be ignited by heat, sparks or open flame. Burning releases hydrogen chloride gas which is extremely irritating and corrosive. Fire may cause violent rupture of tank.

EXPOSURE

Vapor harmful. Liquid may cause skin or eye injury similar to frostbite.

IN CASE OF ACCIDENT

IF THIS HAPPENS



For assistance, phone

CHEMTREC

toll free, day or night

800-424-9300

DO THIS



SPILL or LEAK

Shut off ignition. No smoking or flares. Keep people away. Keep upwind. Shut off leak if without risk. Wear self-contained breathing apparatus and full protective clothing. Flush area with water spray. Run-off to sewer may create explosion hazard; notify authorities.

FIRE

Do not put out fire until leak has been shut off. On small fire use dry chemical or CO₂. On large fire use water spray. Wear self-contained breathing apparatus. Tanks in massive flame contact may rupture violently unless cooled by straight streams of water. Use unmanned monitor nozzle. Apply from side. Keep clear of tank ends. Otherwise, withdraw from area and let fire burn.

EXPOSURE

Remove to fresh air. If unconscious, call a physician. If not breathing, apply artificial respiration, oxygen. In case of contact with liquid, thaw frosted parts with water. In case of exposure to gas from fire, administer oxygen if breathing is difficult.

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8.3 Non-Bulk Containers

8.3.1 General

In many of the specific steps involved in the handling, loading, sampling and process of vinyl chloride, there are points of potential employee exposure to vinyl chloride monomer. Each facility working with vinyl chloride should identify what potential exposure points may exist and perhaps be peculiar to their individual plant operations. When necessary, engineering, work practice and personnel protective controls must be provided as outlined by the OSHA vinyl chloride standard to control employee exposures to, at or below the permissible exposure limit.

8.3.2 Cylinders

8.3.2.1 Cylinders should not be filled except with or by the consent of the owner and then only in strict accordance with the applicable Department of Transportation and OSHA regulations.

8.3.2.2 Areas where cylinders are connected or stored should have sufficient ventilation to prevent vinyl chloride concentrations from exceeding the OSHA permissible exposure limit.

8.3.2.3 Valve protection caps must always be kept securely in place except when the vinyl chloride containers are connected to piping, apparatus or equipment. As soon as the cylinder is disconnected the protective cap must be replaced. Empty vinyl chloride cylinders must be securely closed and capped. Air must not be allowed to enter the vessel.

8.3.2.4 Full or partly emptied cylinders should not be returned without permission of the supplier. Such cylinders must be shipped as full vinyl chloride cylinders and correspondingly, handled, labeled and tagged.

8.3.2.5 In shipping vinyl chloride cylinders, the bill of lading should give cylinder identification number. For each cylinder shipped, show the name of the consignee and indicate whether the cylinder is empty or full.

8.3.2.6 Department of Transportation approved cylinders containing vinyl chloride shall be legibly labeled in accordance with the requirements of OSHA and the Department of Transportation. (See Section 8.2)

8.3.2.7 Magnets or slings should never be used to unload cylinders. When transporting by crane or derrick a suitable platform, cradle or boot should be used.

8.3.2.8 Care should be exercised not to drop cylinders or otherwise handle them roughly.

8.3 Non-Bulk Containers (continued)

8.3.2.9 Cylinders may be moved by tilting and rolling them on their bottom edge. Dragging and sliding them should be avoided.

8.3.2.10 When cylinders are transported by hand truck, they should be held securely in position by means of a locking clamp, chain or other suitable holding device.

8.3.2.11 Cylinders should never be used as rollers for moving any object or material.

8.3.2.12 Avoid disturbing the fusible plug. The safety device should be tagged in order to differentiate it from the discharge connection.

8.3.2.13 Check valves must be installed in feed lines from the cylinder to prevent the reactants from entering the cylinder.

8.3.2.14 Cylinders should be provided with pressure regulators as recommended by the supplier.

8.3.3 Sample (Bomb) Cylinders

Where applicable, the recommendations set forth for cylinders in the preceding section also apply to sample bombs.

8.3.3.1 Stainless steel sample pressure bombs meeting the requirements of Department of Transportation regulation 3B-400 should be used to take quality control vinyl chloride monomer samples. Samples must be taken in bombs that are dedicated to vinyl chloride service. A closed loop sampling system which is designed to include the sample container is preferred in order to minimize the venting of vinyl chloride to the atmosphere.

8.3.3.2 Person(s) directly involved in the collection or analysis of vinyl chloride samples for quality control purposes should wear NIOSH/MESA approved respiratory protection consistent with the requirements of the OSHA vinyl chloride standard. The type of respiratory device utilized should reflect actual or reasonably anticipated vinyl chloride exposure levels.

8.3.3.3 All quality control testing and analyzing should be performed in a laboratory equipped with a chemical laboratory hood having a capture velocity adequate to collect vinyl chloride vapors under conditions prevailing in the laboratory. The discharge from the laboratory hood and from the analytical test instruments shall be designed so that vinyl chloride vapors do not re-enter a nonregulated area.

8.3.3.4 All quality control sampling containers (bombs) should be routinely inspected to assure the integrity of the valves and for leakage.

8.4 Bulk Transport

8.4.1 General

In many handling and unloading steps there are potential points of exposure to vinyl chloride monomer. Consult with the technical service staff of the supplier regarding where monomer unloading exposure points may be in your plant. Check also for other exposure points that are peculiar to individual plant operations.

Design of bulk transport facilities varies and unloading procedures are usually specified by the supplier. Complete understanding between the supplier and the user with regard to equipment and procedures is essential to safety of the transfer operation.

Loading or unloading bulk containers should be considered a hazardous operation and OSHA regulations regarding signs, barricades and respirator use followed.

1. EPA does not approve control devices. The control device used must meet the emission levels.
2. Allow no vehicular traffic in the area during transfer. If this cannot be done, minimize and control traffic by temporary road blocks.
3. If a sample is required before transfer for testing purposes, a stainless steel sample bomb meeting the Department of Transportation's requirements and dedicated to vinyl chloride service should be used. A closed loop sampling system is preferred. The operator taking the sample must use a suitable respirator and appropriate personnel protective equipment during the period of sampling.

Bulk containers delivered with defective valves or other equipment should be held pending instructions from the owner. Only such actions should be taken that will provide for control of immediate safety problems such as obvious leaks and spills.

8.4 Bulk Transport (continued)

8.4.1 General (continued)

In these cases remove sources of ignition. Keep people away. Control the leak by plugs, valves or patches to the extent that the immediate hazard is controlled. Personnel potentially exposed to vinyl chloride vapor should wear NIOSH/MESA approved air supplied respirators.

8.4.2 Miscellaneous Items

Where access to the top of the tank car or truck is needed, the spot should be provided with stairs and a platform of non-combustible construction. Overhead piping and equipment should be counterbalanced for ease of handling.

An emergency shower and eye bath should be directly accessible and within twenty-five feet of the loading or unloading spot.

Fittings - The packing and lubricant for valves and piping must be of a material recommended for vinyl chloride handling.

Pumps and compressors must be equipped with double mechanical seals on packing glands. Space between the seals must be vented to an EPA-approved control device or purged with a pressurized fluid so that there is no external leakage of vinyl chloride.

Unloading or loading piping should be provided with excess flow check valves to control spills in the event of a line break. All unloading or loading piping must be attached to an EPA-approved control system to limit atmosphere emissions to 0.13 FT^3 at STP for each disconnect.

The use of slip gauges is forbidden unless EPA-approved control devices are provided to control the emissions.

8.4.3 Tank Trucks

8.4.3.1 Tank trucks should be visually inspected for leaks and to confirm the contents before they are allowed to enter the plant. Unloading or loading should be performed only during daylight unless the working areas are adequately lighted.

8.4.3.2 The tank truck pad should provide two feet clearance on each side of the truck and four feet at each end. The pad should be sloped to drain spills away from the truck and exposed structures. Tank truck wheels should be blocked and brakes set to prevent movement during loading or unloading and the engine stopped. If the tractor must be separated from the trailer, this must be done before making any connections and place an adequate brace under the front end.

8.4 Bulk Transport (continued)

8.4.3.3 Static electricity is often generated by the tank truck in transit or it may be generated by the loading or unloading operation. All piping, tanks and structures should be electrically bonded by conductors that are adequate for power or lightning protection before any work is initiated. (See NFPA #77).

8.4.3.4 All sampling must be done with EPA-approved systems to minimize vinyl chloride emissions to the atmosphere.

8.4.3.5 Unloading or loading operations should conform to the owner or operators instructions. On completion of the operation, loading or unloading hoses must be evacuated as noted previously and wheel blocks removed.

8.4.3.6 The truck engine should be started and the truck removed only after all connections are severed and the absence of flammable gases confirmed by test.

8.4.4 Tank Cars

Tank cars are the most commonly used bulk container for vinyl chloride shipment. All are unloaded from the top through one or both of the liquid eductor tubes. A third valve provides access to the vapor space of the car for purposes of padding or pressurizing the car to prime the unloading pump. Sampling slip gauging and unloading hose emissions are subject to the same EPA limitations noted for tank trucks.

8.4.4.1 Shippers and/or owners instructions should always be followed and all caution markings on both sides of the tank and dome should be read and observed. If inspection shows the car has faulty equipment or is leaking, the shipper should be contacted for instructions. Shippers' plants and procedures vary; thus, instructions should be obtained regarding loading or unloading a vinyl chloride tank car.

8.4.4.2 The car unloading track should be level and the engine crew should accurately spot the car at the unloading lines.

8.4.4.3 The tank car brakes must be set and the wheels blocked prior to hookup of the pipelines. Unless the car is protected by a closed locked switch, derails should be placed approximately one car length from each end of the car.

8.4.4.4 Caution signs and warning lights prescribed by Department of Transportation regulations must be placed at the derails on the track to warn persons or trains approaching the car from open end or ends of the siding. These must remain in place until the car is ready to be moved.

8.4 Bulk Transport (continued)

8.4.4.5 The contents of the car should be verified by checking the car number with the shipping papers. Many companies also sample the contents for analysis. Failure to verify the car contents can lead to serious and hazardous mixing of reactive chemicals.

8.4.4.6 Typical Unloading Situation

Tank cars of vinyl chloride are filled with liquid up to no more than 86% of the water weight capacity of the tank. Vinyl chloride vapor occupies the space above the liquid. Air or oxygen must not be introduced during unloading or storage to prevent formation of a flammable mixture or premature polymerization. Purge all lines thoroughly with nitrogen before hooking up. Use nitrogen with a maximum of ten ppm oxygen. Nitrogen purging can be minimized by sealing the line and alternately pressurizing with nitrogen and bleeding off the nitrogen to a remote recovery system or incinerator.

Remove the threaded pipe plugs on the liquid and gas valves cautiously and connect the liquid unloading line and the vapor padding line. The vapor pressure is needed to prime the centrifugal forwarding pump, if one is used. To reduce pressure drop, locate the pump as close to the tank car as possible. Some installations have a compressor on the vapor line from the storage tank in addition to the pump. In warm climates, a compressor may be used alone without a pump, but in cold weather a pump is usually needed - with or without the compressor - to facilitate unloading. The vapor pressure used for padding should not exceed 225 psig. Never apply heat to accelerate the unloading of a vinyl chloride tank car.

To obtain flexibility in the unloading system, either stainless steel hose or steel pipe with flexible joints can be used. The flows of vinyl chloride from the tank car should be regulated by a valve in the transfer line. If the discharge rate suddenly becomes too great, an excess flow check valve in the tank car will close. To re-open this valve, close the unloading connection valve until the pressure is equalized.

Start unloading by slowly opening the vapor padding connection valve to the car. If it is necessary to discontinue unloading for any reason, close all valves tightly and disconnect all unloading connections.

The lines leading from the unloading connection valve and the padding connection valve should be purged with nitrogen so that the vinyl chloride monomer vapor in those lines is transferred to the recovery system.

8.4 Bulk Transport (continued)

8.4.4.6 Check the storage tank frequently to determine when the tank car is almost empty. Completely unload the tank car; it should not be used for storage.

A pressure gauge on the unloading line is the best way to indicate when all the liquid has been emptied from the car.

After the car is emptied, stop the transfer pump. Close the padding connection valve and then the unloading connection valve at the top of the car. After this, close all other valves in the vinyl chloride line.

The lines leading from the unloading connection valve and the padding connection valve should be purged so the vinyl chloride monomer vapor in those lines is transferred to the recovery system.

Check the vinyl chloride monomer concentration to make sure there are no invisible leaks from valves. Wear respiratory protection if there is any leakage. Take care of leaks as recommended.

Do not allow tank car to stand with unloading connections attached after unloading has been completed. Remove all lines from the car and disconnect grounding wires.

Reverse the "Flammable Gas" placard on the car so that it reads "Flammable Gal-Empty".

IMPORTANT Leave at least 5-10 psig of vinyl chloride vapor pressure in the empty tank car being returned after closing and sealing all openings. The pressure is necessary to prevent air from entering the car.

8.5 Shipping

8.5.1 Department of Transportation Classification and Regulations

Vinyl chloride is classified by the United States Department of Transportation as a flammable gas. When shipped by rail, water or highway it must be packaged in authorized containers and shippers must comply with Department of Transportation regulations regarding packaging, loading, handling, labeling, marking and placarding. (R. M. Graziano's Tariff No. 31, 1977 is a source of condensed Department of Transportation Regulations for Hazardous Materials.)

8.5 Shipping (continued)

8.5.2 Shipping Containers - Type and Size Title 49 CFR Transportation Part 173.304

Cylinders - 4B150, 4BA225, 4BW225, 3A150, 3AA150,
DOT-25 and 3E-1800.

Cylinders with brazed seams are not permitted.

Maximum filling density - 84%.

Title 49 CFR Transportation Part 173.315
Requirements for Compressed Gases in Cargo Tanks
MC-330 and 331.

Maximum filling density - 84%.

Title 49 CFR Transportation Part 173.314
Requirements for Compressed Gases in Tank Cars
DOT 106A500X

Maximum filling density - 84%.

DOT 105-200W

Maximum filling density - 87%.

DOT 112A340W

Maximum filling density - 86%.

DOT 114A340W

Maximum filling density - 86%.

8.6 Transportation Emergencies

8.6.1 Assistance Available

8.6.1.1 CHEMTREC (CHEMical Transportation Emergency Center)

This center, located in Washington, D. C. at the offices of the Manufacturing Chemists Association, is manned 24 hours per day, seven days a week, and provides by telephone immediate response/action information for police, fire fighters and others concerned with the control of chemical transportation emergency situations.

8.6 Transportation Emergencies (continued)

8.6.1 Assistance Available (continued)

8.6.1.1 CHEMTREC (continued)

For assistance, dial:

*(800) 424-9300 in the 48 contiguous States of the USA.

*(800) 483-7616 in District of Columbia.

*(200) 483-7616 in Alaska.

In Canada, call Canadian Chemical Producers Association's TEAP (Transportation Emergency Assistance Plan).

*Use long distance prefix if needed.

8.6.1.2 Company Mutual Aid

A number of vinyl chloride manufacturing companies voluntarily participate in a mutual-aid organization under which, in the event of a transportation accident, the closest company vinyl chloride plant will dispatch a qualified adviser to the scene of the accident if requested to do so by the shipper of the commodity.

8.6.2 Emergency Control

8.6.2.1 Personnel Attending Accident Scene

Shippers' representatives do not take charge of emergency operations. They are present as advisers only.

8.6.2.2 Recommended Emergency Kit

The following are considered essential:

- a. Explosion meter
- b. NIOSH/MESA approved self-contained breathing apparatus
- c. Wood plugs and wood mallet
- d. Data sheet and pencil
- e. Camera and film
- f. Flashlight (Bureau of Mines approved)
- g. Rubber gloves
- h. Slicker suit
- i. Rubber overshoes
- j. Safety lines (braided stainless, plastic covered) and harness

8.6 Transportation Emergencies (continued)

8.6.2 Emergency Control (continued)

8.6.2.2 Recommended Emergency Kit (continued)

- k. Goggles
- l. Safety hat
- m. O-rings
- n. Strap wrench
- o. Ten-inch adjustable wrench
- p. Screwdriver
- q. Ground continuity meter
- r. Large first aid kit and collapsible water container, approximately fifty gallons. The water container should be filled at the emergency site and be available for eye wash or treatment of chemical skin contacts.

8.6.2.3 Recommended Procedures

Leaks of Vinyl Chloride

I. Controllable Leaks

- a. Small holes: Drive wooden plugs.
- b. Larger holes: Neoprene patch, bonded or chained to tank. Special rigs should be left to the judgment of the man at the scene.
- c. Jagged holes are difficult to close.
- d. Potassium bicarbonate will extinguish a vinyl chloride fire but reignition often occurs. Use it around valves if it appears that a leak can be subsequently controlled.

II. Uncontrollable Leaks - No Fire

- a. Evacuate area and isolate.
- b. Remove sources of ignition.
- c. Control spread of vapors by water spray.

III. Uncontrollable Leaks - Fire

- a. Evacuate and isolate area.
- b. Keep adjacent cars cool, if possible, with water spray.
- c. Keep nonessential personnel away.
- d. Treat a non-burning tank car in vicinity of fire as if it is about to rupture.
- e. If vinyl chloride gets to a sewer, evacuate area and flush sewers with fire hoses.

8.6 Transportation Emergencies (continued)

8.6.2 Emergency Control (continued)

8.6.2.4 Spilled Vinyl Chloride

Spilled vinyl chloride should not be deliberately ignited.

8.6.2.5 Recovery or Removal of Vinyl Chloride

Depending upon circumstances and extent of car damage, vinyl chloride may be recoverable, but recovery should not be the determining factor in controlling the situation.

- a. If car condition permits, transfer contents to empty tank car using nitrogen pressure.
- b. If car is ruptured, attempt to use pump with flooded suction.
- c. If pumping is impractical, use water or oil to float out remainder of vinyl chloride.
- d. Fill empty tank with water or nitrogen.
- e. If a vinyl-ice mixture forms, keep a water stream on the tank until it dissipates.
- f. Handling of vinyl chloride in a damaged car can be influenced by weather conditions. At low temperatures, since vaporization is reduced, patch tank, if possible, so that it can be moved.

8.6.3 Marine Emergencies

8.6.3.1 United States Coast Guard regulations (reference Vinyl Chloride Coast Guard Standard, i.e. Parts 40, 151, and Chapter 1 of Title 46 CFR. . .) require that a cargo information card for vinyl chloride be carried aboard the tank barge mounted near a warning sign and in such a position as to be easily read by a man standing on the deck of the barge. The cargo information card shall also be carried on the bridge or in the pilot house of the towing vessel. Copies are available from the Manufacturing Chemists Association.

8.6.3.2 Special Safety Equipment

In addition to normal safety equipment provided at the dock, the following special items should be available:

- a. NIOSH/MESA approved self-contained breathing equipment (at least two and two spare bottles).
- b. Explosimeters.
- c. Ground continuity meter.

8.6 Transportation Emergencies (continued)

8.6.3 Marine Emergencies (continued)

8.6.3.2 Special Safety Equipment (continued)

- d. Water with an appropriate number of nozzles.
- e. Dry chemical fire extinguisher.
- f. MCA Chemical Safety Data Sheet SD-56 and Cargo Information Card CIC-80.

8.6.3.3 Recommended Emergency Procedures

8.6.3.3.1 Leaks of Vinyl Chloride

I. General - Activate Alarm

II. Controllable Leaks - No Fires

- a. Evacuate area of nonessential personnel and isolate leak from source.
- b. Eliminate ignition source.
- c. Control spread of vapors by water fog.
- d. Attempt to repair leak using adequate safety protection procedures.

III. Uncontrollable Leaks or Ruptures - No Fires

- a. Evacuate area of nonessential personnel and isolate area.
- b. Remove all sources of ignition.
- c. Use water spray to prevent accumulation of liquid and to dissipate vapor cloud. It is not recommended that the ship's fire water supply be hooked into the city water supply.

IV. Uncontrollable Leaks - Fire

- a. Isolate area.
- b. Evacuate area except for emergency personnel.
- c. Use water fog on fires and fumes (do not extinguish fire unless leak can be controlled).
- d. Use copious amounts of water to keep adjacent areas cool.
- e. Treat adjacent tanks as if about to rupture.
- f. Make provisions to minimize the mixing of air with vinyl chloride vapor in confined spaces and the burning tanks or line (water, N₂ or inert gases).

8.6.3.3.2 Spilled Vinyl Chloride

Spilled vinyl chloride should not be deliberately ignited.

8.6 Transportation Emergencies (continued)

8.6.3.3 Recommended Emergency Procedures (continued)

8.6.3.3.3 Recovery or Removal of Vinyl Chloride

Depending upon circumstances and the extent of the tank damage vinyl chloride may be recoverable but provisions must be made to keep air out of the tank.

- a. If tank condition permits, transfer contents to an empty tank or back to shore.
- b. If tank cannot be patched and it does not have a deep well pump or the deep well pump cannot be used, sparge heated nitrogen into the bottom of the tank to vaporize the vinyl chloride.