

Conp: Volcanic

Return DJS

Property of
Chem. Eng. Dept.
VINYL DEPT. 42
46C

Chemical Safety Data Sheet SD-56

PROPERTIES AND ESSENTIAL INFORMATION

FOR

SAFE HANDLING AND USE

OF

VINYL CHLORIDE

ADOPTED 1954

Chemicals in any form can be safely stored, handled or used if the physical, chemical and hazardous properties are fully understood and the necessary precautions, including the use of proper safeguards and personal protective equipment, are observed.



Manufacturing Chemists' Association, Inc.

1625 Eye Street, N. W., Washington 6, D. C.

100067

VOLCANIC

CHEMICAL SAFETY DATA SHEET

VINYL CHLORIDE

SUMMARY

Vinyl chloride is a highly volatile extremely **FLAMMABLE** compressed gas which is ordinarily handled in liquefied form under pressure. It has a mild anesthetic action in concentrations above 500 ppm. and its vapors are irritating to the eyes.

Precautions necessary in handling the material are detailed in the body of the Safety Data Sheet. Key points to consider for safe handling include:

1. Keep away from heat, sparks and open flame.
2. Provide adequate ventilation.
3. Ground equipment and containers before discharging to reduce danger of ignition from static sparks.
4. In discharging do not heat containers above 50°C. (122°F.). No heat should be applied to tank cars.
5. All equipment should be of steel and have a designed working pressure of at least 100-150 psi.
6. In the event of accidental leaks, spills or whenever excessive vapor concentrations may be encountered only personnel equipped with approved respiratory protection should be permitted in the contaminated area.
7. Chemical safety goggles should be worn when discharging containers or tank cars or whenever there is a danger of the liquid or saturated vapor coming in contact with the eyes.
8. Waste disposal should be away from any source of ignition. Dilute phenolic residues before discharging to sewer.

In case of fire use carbon dioxide or dry chemical extinguishing equipment. In the event of contact with the liquid remove contaminated clothing immediately. For eyes flush immediately with large quantities of water for at least 15 minutes while medical attention is being sought.

100068

VOLCANIC

Chemical Safety Data Sheet

VINYL CHLORIDE

Adopted February, 1954

1. NAME

Chemical Names: Vinyl Chloride
Chloroethylene
Chloroethene
Common Name: Vinyl Chloride
Formula: CH_2CHCl

2. PROPERTIES

2.1 Grade:

Technical with inhibitor. (Purity of sample 99.42%)

2.2 Important Physical and Chemical Properties:*

Boiling Point.....	—13.8°C. (+7°F.)
Color.....	Colorless or water white
Corrosivity.....	Noncorrosive at normal atmospheric temperatures when dry (moisture free). In contact with water at elevated temperatures vinyl chloride accelerates corrosion of iron or steel.
Explosive Limits (Percent by Volume in Air).....	Lower 4% ; Upper 22%
Flash Point.....	—78°C. (—108.4°F.), Open-Cup
Hygroscopicity.....	No
Critical Pressure.....	52.7 Atmospheres
Critical Temperature.....	158.4°C. (317°F.)
Deliquescence.....	No
Ignition Temperature, Autogenous.....	472.22°C. (882°F.) (Vapors above —60°F.)
Light Sensitivity.....	Not a factor in handling inhibited vinyl chloride
Melting Point.....	—153.71°C. (—245°F.)
(Freezing Point)	
Molecular Weight.....	62.50
Odor.....	Sweet smelling gas
Physical State.....	Gas at ordinary temperature and pressure. Liquid under pressure in cylinders or pressure vessels at room temperature.
Reactivity.....	Polymerizes readily in presence of air, sunlight, oxygen or heat. This behavior is due to the presence of a double bond. Otherwise vinyl chloride is quite stable.
Specific Gravity.....	.9121 @ 20°/20°C. (Water = 1.00)
Vapor Density.....	2.15 (Air = 1.00)
Vapor Pressure.....	2580 mm. of mercury 20°C. (68°F.)

*Many of the data recorded under this paragraph were determined in the research laboratory of one of the large producers of vinyl chloride and are based on a technical grade material having a purity of 99.42%. Materials from other sources may vary in accordance with the nature of the impurities or the character of the inhibitor present.

3.2.3 Each shipping container must bear the ICC red label for FLAMMABLE compressed gases.

3.2.4 Tank cars and railroad cars carrying one or more containers of vinyl chloride must bear the ICC DANGEROUS placard.

3.3 Disposal and Return Precautions

3.3.1 Small containers (ICC-4B300 and ICC-4BA300, without brazed seams, ICC-3A300, ICC-3AA300) should be drained free of liquid vinyl chloride and the valves closed tightly before they are returned to the supplier. No air should be permitted to enter the container (See 4.3).

3.3.2 In addition, the following precautions must be taken:

3.3.2.1 Return of Small Containers

The cylinder valve protection cap or outlet cap must be securely replaced. The lower portion of the ICC shipping tag, if attached to the cylinder, must be removed. In other cases, applicable to ICC Regulations, compliance is essential. Bill of lading should give the cylinder identification number (which appears on the shoulder of cylinder) for each cylinder shipped, show name of consignee and indicate that the cylinders are empty (See 3.3.5).

Full or partly emptied cylinders should not be returned without permission of the supplier. Such cylinders must be shipped as full cylinders and correspondingly labeled and tagged (See 3.2). All empty cylinders should be returned promptly.

3.3.3 Tank cars (ICC-106A500, ICC-106A-500X, ICC-105A300, and ICC-105A300W) should be drained free of liquid vinyl chloride, the valves should be securely closed and the valve plugs replaced. No air should be permitted to enter the vessel. The inert gas used for the unloading procedures (See 4.4 Tank Cars) should be left in the vessel at a pressure not to exceed the service pressure for which the car is authorized.

3.3.4 In addition, the following precautions must be taken:

3.3.4.1 Return of Tank Cars

As soon as a tank car is completely unloaded, all valves must be made tight, the unloading connections must be removed and all closures made tight, except that heater coil inlet and outlet pipes (if any) must be left

open for drainage. Heater coils must never be used in unloading vinyl chloride. Empty tank cars should be returned as promptly as possible, in accordance with instructions received from shipper.

3.3.5 Follow ICC Regulations regarding the replacement of closures, condition and labeling of empty containers; condition of empty cars and placard requirements before returning to shipper. The ICC DANGEROUS placards on sides and ends of tank cars must be removed, or reversed (if in metal placard holders) by the party discharging the tank car. The empty car must be offered to the receiving carrier either without placards, or preferably with four (4) DANGEROUS-EMPTY placards.

4. UNLOADING AND EMPTYING

4.1 Health Hazards (See 8. Health Hazards and Their Control)

4.1.1 Aside from the risk of fire and explosion, vinyl chloride presents no other very serious problem in general handling. The presently accepted upper limit of safety as a health hazard is 500 ppm.

4.2 Fire and Explosion Hazards

4.2.1 Vinyl chloride should always be handled with full recognition of its flammability. Precautions should be taken both to keep the material enclosed and to eliminate sources of ignition. Reliance must be placed upon the elimination of all sources of ignition and on the provision of sufficient ventilation to keep escaping vapors at nonflammable levels (See 6.2).

4.3 Cylinders

4.3.1 Precautions generally applied to use of cylinders (ICC-4B300 and ICC-4BA300, without brazed seams, ICC-3A300, ICC-3A-A300) for flammable liquefied gases should be used.

4.3.2 A water bath heated to a maximum of 50°C. (122°F.) may be used to empty cylinders by means of the vapor pressure of the vinyl chloride.

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

4.3.4 When the cylinder is empty, the valve should be securely closed. Air should not be allowed to enter the container.

valves should be of steel or a suitable alloy not bearing copper, designed for working pressures of 150 psi or over. All-welded construction is preferred to riveted construction. It is recommended wherever possible that all liquid inlet lines enter the bottom or extend to the bottom of the vessel. This guards against the accumulation of static electricity. All equipment should be properly grounded with resistance to ground never exceeding 25 ohms. An efficient water spray system should be installed or made available. Adequate diking and drainage should be provided under tank area to confine and dispose of the liquid in case of vessel rupture. Any cylinders used to store vinyl chloride must meet ICC Specifications.

5.2.2 ISOLATION

Storage areas should be selected in accordance with local codes or authorities having jurisdiction. (Assistance may be obtained from such organizations as National Board of Fire Underwriters, Factory Insurance Association, Associated Factory Mutual Fire Insurance Companies.) For highly volatile and flammable material, storage should be located outside of buildings. Cylinders containing vinyl chloride should be stored always in a vertical position, outside of buildings, and in an isolated and well ventilated area. It is preferable to store cylinders in the open, but provision should be made to shield them from the direct rays of the sun and prevent accumulation of dirt, snow, water, or ice on valves or safety devices.

5.2.3 COMPATIBLE AND DANGEROUSLY REACTIVE MATERIALS

Tanks in vinyl chloride service should be used only for the storage of vinyl chloride (See 6.8). Before vinyl chloride is placed in a tank, the vessel should be purged with an inert gas until free of air. Vinyl chloride is generally noncorrosive at normal atmospheric temperatures when dry (moisture free). However, mild to appreciable corrosion has been noted even at ordinary temperature. This may be due to the presence of impurities. In contact with water at elevated temperatures vinyl chloride accelerates corrosion of iron or steel. Acetylene as an impurity in vinyl chloride may form an explosive compound (acetylide) when exposed to copper or possibly copper alloys.

5.2.4 VAPOR-PROOF OR EXPLOSION-PROOF REQUIREMENTS

All electrical equipment, motors, lights, and flashlights used in an area in which vinyl chloride is stored or handled should conform

to the National Electrical Code (Class I, Division II for storage; and Class I, Division I for use).

5.2.5 VENTING REQUIREMENTS

An adequate system for normal and emergency venting should be installed. All vent lines should extend to a safe area free of any source of ignition. The point of outlet should be equipped with an approved flame arrestor. Relief valves should be installed in pairs, parallel, using transflow valving to facilitate periodic testing and repairing.

5.2.6 VENTILATION

All storage areas should be provided with continuous ventilation. Pits, depressions and basements should be avoided.

5.2.7 PROTECTION FROM ELECTRICAL STORMS

Storage tanks for vinyl chloride should be protected from electrical storms and induced static electricity by grounding of all equipment.

5.2.8 PROTECTION FROM INTERNAL EXPLOSIVE MIXTURES

Storage tanks and other vessels should be maintained under positive pressure utilizing an inert gas when necessary or vapor pressure of the vinyl chloride. Vessels should be provided with bottom inlets under the liquid, or dip pipe extending from the top of the vessel to within inches of the bottom of the vessel to protect against a static discharge.

6. HANDLING

6.1 Health Hazards (See 8. Health Hazards and Their Control)

6.1.1 Aside from the risk of fire and explosion, vinyl chloride presents no other very serious problem in general handling. The presently accepted upper limit of safety as a health hazard is 500 ppm.

6.2 Fire, Explosion, and Polymerization Hazards

6.2.1 FIRE HAZARDS

Vinyl chloride should always be handled with full recognition of its volatility and its flammability. In general, precautions should be taken both to keep the material enclosed and to eliminate all sources of ignition. In small

100074

6.4.2 The education and training of employees to work safely and to use the personal protective equipment or other safeguards provided for them is a responsibility of supervision.

6.4.3 Employee education and training should emphasize the need of handling vinyl chloride according to the methods outlined in this data sheet.

6.4.4 Before being placed on the job, new or transferred employees should be thoroughly instructed and questioned in respect to the proper handling of vinyl chloride. Employees on the job should be reinstructed periodically.

6.4.5 Each employee should know the location, purpose, use and maintenance of personal protective equipment and be thoroughly trained in when and how to use the equipment (See 6.5).

6.4.6 Each employee should know the location of safety showers, eye baths, bubbler drinking fountains, faucets or fire extinguishing equipment.

6.4.7 Only reliable, properly trained employees should be given the responsibility of operating valves which control the flow of vinyl chloride to and from storage tanks, tank cars, and cylinders, or drawing samples and venting to the atmosphere.

6.4.8 Employees should be trained to report to the proper authority all suspected leaks or equipment failures and any signs of illness of personnel.

6.4.9 Each employee should know what to do in case of an emergency, in rendering first aid measures, and should realize the necessity for prompt administration of artificial resuscitation when overcome by vinyl chloride vapors (See 8.4.2.1).

6.5 Personal Protective Equipment

6.5.1 AVAILABILITY AND USE

Personal protective equipment is not an adequate substitute for good, safe, working conditions, adequate ventilation, and intelligent conduct on the part of employees working with vinyl chloride. Such equipment may protect the individual wearing it while others in the area may be exposed to danger. The correct usage of personal protective equipment requires the education of the worker in the proper employment of the equipment available to him (See 6.4). Under conditions which are sufficiently hazardous to require protective equip-

ment, the use of it should be supervised. In all cases, the type of protective equipment selected should depend upon the nature and degree of the hazards existing.

The following personal protective equipment should always be used for the purposes mentioned and as specified in Section 8. Health Hazards and Their Control, and in other sections of this data sheet:

6.5.2 EYE PROTECTION

6.5.2.1 *Chemical Safety Goggles:* cup-type or rubber-framed goggles, equipped with approved impact resistant glass or plastic lenses, should be worn whenever there is danger of the vinyl chloride (in liquid or saturated vapor form) coming in contact with eyes. Goggles should be carefully fitted by adjusting the nose piece and head band to ensure maximum protection and comfort.

6.5.2.2 *Spectacle-type Safety Goggles:* metal or plastic rim safety spectacles with perforated side shields which can be obtained with prescription safety lenses or suitable all plastic safety goggles may be used where continuous eye protection is desirable. These types, however, should not be used where complete eye protection against chemicals is needed.

6.5.2.3 *Face Shields:* plastic shields (full length, eight inch minimum) with forehead protection may be worn in lieu of, or in addition to, chemical safety goggles where complete face protection is desirable. Chemical safety goggles should always be worn as added protection where there is danger of vinyl chloride striking the eyes from underneath or around the sides of the face shield.

6.5.2.4 Each employee should know the location of safety showers, eye baths, and bubbler drinking fountains for flushing the eyes.

6.5.3 RESPIRATORY PROTECTION

Respiratory protective equipment must be carefully maintained, inspected, cleaned, and sterilized at regular intervals, and always before use by another person. Personnel wearing such equipment must be carefully instructed as to its operation and limitations.

6.5.3.1 Air or Oxygen Supplied Masks

6.5.3.1.1 Air or oxygen supplied masks, equipped with full face pieces and approved by the U. S. Bureau of Mines for this purpose, should be used under the following conditions,

belts, rescue harness, lifeline, clothing and gas masks should be worn as required by the specific nature of the work and the hazards involved.

6.5.6.3 Frequent inspections and necessary repairs should be made to all personal protective equipment so that it is always ready to give proper protection to the wearer.

6.5.6.4 Facilities for personal cleanliness should be provided and time allowed for thorough washing before lunch and at the end of the work day.

6.6 Engineering Controls

6.6.1 Selection of a site or location for apparatus or equipment to ship, handle, store or manufacture vinyl chloride should be made by the direction of chemical engineers or mechanical engineers fully aware of the hazards encountered in dealing with vinyl chloride (See 5.2.2).

6.6.2 Processes should be designed so that the operating personnel will not be exposed to direct contact with vinyl chloride or its vapor. The technical problems of designing equipment, providing adequate ventilation, and formulating operational procedures which promise maximum security and economy, can be handled best by engineers or other competent personnel. The manufacturers of vinyl chloride, and of the equipment in which it is to be used, are always prepared to help with these problems (See 5.2.1).

6.6.3 In the handling of vinyl chloride or operation of any type of vinyl chloride system, all valves, pipe lines, vents, safety devices, etc., should be so located that they can be readily inspected and repaired. They should always be in proper order and condition before the operation is started. All handling and storage equipment should be located away from any source of sparks, flames, heated surfaces and all sources of ignition which might cause fires or explosions. All charging and discharging pipes should enter through, or extend to, the bottom of all containers to minimize vaporization of the liquid and possible generation of static electricity.

6.6.4 It is essential for safety that equipment will be used and maintained as recommended by the manufacturer and that a periodic test schedule of the equipment, including safety devices, should be followed. All vent lines should extend outdoors to an area free of any source of ignition for discharge.

6.6.5 All electrical installations should conform with the National Electrical Code. All equipment should be properly grounded to prevent accumulation of static.

6.7 Ventilation

6.7.1 If the workroom or operating area is separate from vinyl chloride storage or processing equipment, general ventilation is adequate. For emergencies, however, the area should be provided with mechanical exhaust ventilation to maintain concentrations below flammable limits.

6.7.2 In the processing or storage area, if outside location is impracticable, special emergency equipment for ventilation is necessary under abnormal conditions, such as leaks or spills.

6.7.3 Six or more changes of air per hour are considered adequate for buildings housing storage or processing equipment for flammable liquids, vapors, or gases under pressure.

6.7.4 Buildings of substantial construction should have at least one square foot of door, window, or nonrigid roof area for each 35 cubic feet of volume to prevent serious structural damage in the event of explosion within the building.

6.7.5 The most important consideration in ventilation is to ensure an adequate air flow away from the work area.

6.7.6 All ventilating systems should be inspected periodically and maintained in a safe and efficient working condition.

6.7.7 Under abnormal conditions, such as when leaks or spills occur, all available ventilation should be used.

6.8 Tank and Equipment Cleaning and Repairs

6.8.1 The hazardous nature of tank or vessel inspections, cleaning, and repairs requires that the foreman and crew be selected, trained, and drilled carefully. They should be fully familiar with the hazards and safeguards necessary for the safe performance of the work. Use only spark-resistant tools.

6.8.2 Wherever possible, vessels should be cleaned from the outside, using cleanout manholes or openings provided for this purpose.

6.8.3 First consideration in vessel entry work requires the vessel be properly isolated

7.3 When a waste disposal problem arises as a result of a major spill or equipment rupture, only properly protected and qualified personnel should remain in the area (See 6.3 and 6.5).

7.4 Waste mixtures containing vinyl chloride should not be allowed to enter drains or sewers as serious explosion in such systems may result (See 6.3).

7.5 Removal of inhibitor, such as phenol in form of sodium phenolate, should be done by dilution to approximately 1% solution (See SD-4, Part 7. Waste Disposal).

8. HEALTH HAZARDS AND THEIR CONTROL

8.1 Hazards

8.1.1 GENERAL

Aside from the risk of fire or explosion, vinyl chloride presents no other very serious problem in general handling. The presently accepted maximum allowable concentration is 500 ppm.

8.1.2 SYSTEMIC EFFECTS

In concentrations well above 500 ppm, vinyl chloride acts as a mild general anesthetic.

8.1.3 LOCAL EFFECTS

In contact with the skin vinyl chloride is *irritating*. Prolonged contact will result in refrigeration and freezing.

8.2 Prevention and Control

Vinyl chloride is not a serious industrial hazard provided precautions are taken to avoid leaks or spills which might provide a fire or explosion hazard. Where serious leaks or spills do occur, the workmen present in the area should be evacuated, and persons returning to the area to repair or clean up equipment should be provided with appropriate gas masks, self-contained oxygen units, or air supplied hoods.

8.2.1 EMPLOYEE EDUCATION (See 6.4 Employee Education and Training)

Employees working in areas where vinyl chloride is handled or stored should be thoroughly and repeatedly warned of the anesthetic properties of vinyl chloride gas and instructed as to what to do if anesthetic effects are detected in themselves or in others (See 8.4.2.1).

Emphasis in training should be placed on:

1. *The use of artificial respiration in cases where breathing has stopped because of deep anesthesia.*
2. *The necessity of immediate removal of contaminated clothing and shoes in case of liquid spills.*
3. *Repeated washing of the eyes with copious amounts of water in case of liquid splashes.*

8.2.2 VENTILATION

Work areas where vinyl chloride is handled or stored should be provided with adequate ventilation. The concentration of vinyl chloride should be kept below the upper safe limit of 500 ppm. at all times.

8.3 Personal Protective Equipment

8.3.1 No personal protective equipment is an adequate substitute for safe working conditions and intelligent conduct on the part of employees who work with vinyl chloride. Furthermore, the correct usage of personal protective equipment requires education of the worker in the proper employment of the materials available to him. Under conditions which are sufficiently hazardous to require personal protective equipment, the use of it should be supervised.

8.3.2 Employees who may be subjected to severe exposure to vinyl chloride, as in tank and equipment cleaning and repairs, in decontaminating extensive areas after large spillage, or in cases of failure of piping or equipment, should be provided, when indicated, with proper eye, respiratory, skin, and mucous membrane protection as follows:

- (a) Suitable gas tight safety goggles.
- (b) Rescue harness and life line for those entering tank or enclosed storage space (See 6.7).
- (c) Hose masks with hose inlet in a vapor-free atmosphere, air line masks with proper reducing valve and filter, suitable for use only where conditions will permit safe escape in case of failure of the compressed air supply, or self-contained breathing equipment with stored oxygen or air (such equipment allows greater mobility but usually requires more highly trained men).