

COPY NO. 46

MONOCHEM SAFETY HANDBOOK

Revised August 1, 1974



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MONOCHEM, INC.
Geismar, Louisiana

August 1, 1974

I. INTRODUCTION

To Monochem Employees:

This Safety Handbook has been prepared to guide you in the safe performance of your job. Years of experience in the chemical industry have proven the value of policies written in this handbook and they will, if followed, provide maximum safety to Monochem personnel and to equipment.

You should become thoroughly familiar with all the general safety rules and with those other sections of the manual covering jobs and methods which you encounter in the performance of the work assigned to you. It is impossible to formulate rules for every combination of circumstances that may occur in the day-to-day operation and maintenance of a plant. Accordingly, situations may arise when the experience of the safety and supervisory personnel justifies some addition, deviation, or alteration of procedures given herein.

An alert mind and good, sound judgment can do much to attain the objectives of reducing accidents to personnel and equipment. Know your job, know its hazards, do not take chances. You are responsible for your own safety; if in doubt about any job, consult your foreman or any other member of supervision.

Remember, Monochem's operation will be only as safe as you make it.

Jack R. Little
Vice President
In Charge of Operations

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II. CARDINAL RULES

- A. Smoking will be permitted in designated areas only.
- B. Eye protection must be worn while inside the fenced plant area.
- C. Hard hats must be worn inside the fenced plant area.
- D. The drinking of intoxicating beverages on Monochem property is strictly forbidden. No person under the influence of alcohol will be allowed to pass through the gates of the fenced area.
- E. Before any vessel, tank, or tank car may be entered, a hazardous work permit must be obtained. (See section on Vessel Entry for exact details.)
- F. Shoes of the canvas or sandal type will not be worn in the fenced plant area.
- G. All injuries must be reported to First Aid.
- H. Ear protection must be worn by all personnel in all areas that have been designated and posted.
- I. No facial hair is allowed which would prevent a proper sealing surface of any respiratory protection device.

III. GENERAL SAFETY RULES

A. Smoking

- 1. No matches or lighters are permitted inside the plant fenced area.
- 2. Smoking will be permitted in these designated areas only:
 - a. Administration Building, excluding the Laboratory.
 - b. Engineering and Maintenance Offices.
 - c. Personnel and Safety Building.
 - d. All area control rooms, including the first and second floors of the boiler structure.
 - e. Electric lighters will be provided in all areas with the exception of a. and b. above.

B. Roads and Walkways

- 1. Always walk on the left side of the road facing vehicular traffic.
- 2. Do not run (except in an emergency).

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3. Use the same rules of the road riding a bicycle as you would in an automobile.
4. All safety and traffic signs on roads and parking areas are posted for your protection and benefit. You are expected to be governed by the direction given.
5. Roads and walkways that have been barricaded were blocked for a purpose. Do not remove barricades or drive vehicles around same, unless you have permission to do so from area foreman.
6. Do not drive vehicles across Fire Hose or High Pressure Air Hose stretched across roadways.
7. Do not attempt to move any vehicle from an area where vinyl chloride, natural gas, acetylene or any other combustible material is present. Cut off ignition and leave the area immediately.
8. Observe plant speed limits at all times.
9. Walkways are to be used whenever possible. Avoid climbing over fire walls, pipelines, or similar obstruction except when absolutely necessary.

C. Ladders and High Work

1. Any employee using a ladder will give it a visual check for any defects.
2. Ladders with broken rungs, cracked sides, or without safety shoes must not be used.
3. Any ladder found defective must be tagged and returned to the shops for repair.
4. The foot of a ladder must not be placed more than 1/4 its length away from the object on which the ladder is leaning.
5. Use care in placing ladders. If there is a danger of it slipping, have someone hold it or otherwise securely anchor it.
6. Do not stand on the two highest rungs. Get a longer ladder.
7. Avoid overreaching when working from a ladder. Move the ladder closer to the job.
8. A standby man or a barricade must be used if a ladder is erected near a door or passageway.

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9. Do not attempt to climb a ladder with tools or materials in your hands (step ladder excluded).
10. Always face the ladder ascending or descending, using both hands on the sides.
11. Avoid working where overhead hazards are present. Rope off area to keep it free of personnel.
12. Material or tools should never be dropped or thrown from elevated places.

D. Use of Solvents and Other Flammable Liquids

1. Gasoline, alcohol and other flammable or toxic liquids shall not be used for cleaning mechanical equipment, clothes, washing hands, degreasing tools or any other equipment.
2. Use only solvents that have been approved by the Safety Department for that particular area or job.
3. Safety cans must be used when handling flammable liquids such as gasoline, etc.

E. Electric Equipment and Extension Cords

1. Electrical equipment shall be operated by authorized personnel only.
2. All electrical equipment must be grounded.
3. Only flashlights that have been approved and issued through the stores shall be used in the plant.
4. Only electric lights or hand lanterns approved by the Safety Department may be used in vessels, drums, towers or any other area where combustibles may be present.
5. All extension cords shall be inspected by an electrician after each job and necessary repairs made before re-use.
6. Danger tags shall be attached to breaker switches when opened for the purpose of working on circuit, motor or motor-driven equipment.
7. When more than one craft is working on the same equipment, each must have a danger tag attached to the breaker switch.
8. Never attempt to pull another person away from a hot line with your bare hands. Cut off current or use a non-conductive material to dislodge the person's contact.
9. If the person is unconscious after contact with hot line is broken, artificial respiration should be started at once, and continued until the services of a physician can be obtained.

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F. Housekeeping

1. It is the responsibility of each employee to do his part in keeping the area in which he works clean and orderly.
2. Trash and waste must be placed in containers provided.
3. Oil and grease spills should be cleaned up as soon as possible. Non-combustible absorbents are available for this purpose.
4. New materials to be used or old materials to be removed must be placed in such a manner so they will not be a tripping hazard to mechanics or operators working in area.
5. Soft drink bottles should be returned to their proper containers.

G. Clothing

Certain types of clothing are furnished for your protection when working under abnormal conditions. However, the type of clothing you wear while performing your normal duties can be an important factor in your continued safety and well-being.

1. Wear sufficient well-fitting clothing to cover the body. Going shirtless or in shorts will not be allowed within the plant.
2. Greasy or oily clothing should be removed. It may burn like a torch if you get too close to a flame.
3. Avoid wearing rings, jewelry, or loose clothing around moving machinery, such as emery wheels, rotating shafts and motors.
4. Plastic coated and cotton gloves are furnished by the Company and must be worn for specific jobs.
5. Safety shoes are recommended, but this is optional. Open-toed shoes or sandals must not be worn within the operating section of the plant.

H. Sample Container Safety (Liquid VCM Samples)

1. Samples for transport to the Lab are taken in approved sample cylinders which are provided for this purpose.
2. During sampling, cylinders must have ground wires attached and must be properly vented to the flare line through appropriate connections.
3. Immediately upon arrival at the Lab, VCM samples are taken to the room designated as "VCM Lab."
4. Make certain the hood is operating each time it is used by feeling the flow of air at the rear bench top in the hood. If air flow is not evident, notify your supervisor and do not vaporize VCM until the problem is corrected.

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5. All analyses, transfers, and sample handling involving vaporization of VCM are conducted in the hood. Attach ground wires to cylinders during transfer to prevent buildup of electrical charges.
6. For gas chromatographic analysis, 10-15 mls VCM are transferred to a plastic bag equipped with an inlet. After analysis, excess sample is vented in the hood. Amounts larger than 100 grams are vented through the disposal system outside the Laboratory.
7. Take all reasonable precautions to avoid exposure to VCM through inhalation or skin exposure.

I. Instrument Department

1. Certain necessary precautions should always be taken when opening meter and instrument lines.
 - a. Check with operating personnel of the area to be sure all lines have been drained or pressure relieved.
 - b. Even though all steps have been taken to relieve pressure, treat all lines as if they were under pressure.
2. Instrument Technicians must wear goggles or face shields when opening lines or meters containing or having contained a corrosive acid or chemical, hot or cold materials.
3. Mercury is a very toxic material which may cause difficulty either from breathing its vapors or from contact with the skin.
 - a. Under no circumstances shall an employee heat mercury in an open container.
 - b. Never permit mercury to accumulate in cracks on floors or work benches.
4. Work on electrically controlled instruments and valves involves exposure to low voltage, usually 110 volts. Contact with it can be fatal. Therefore, necessary precautions must be observed when working around such equipment.
5. When dismantling meters in the shop or field, care must be taken to avoid injury from unsuspected trapped pressure.

J. Office Personnel

1. General

- a. Keep desk and file drawers closed when they are not being used. Open only one file drawer in a cabinet at a time. Opening more than one may cause it to tip.

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- b. Never stand on drawers, chairs, desk tops, waste cans or other similar objects.
- c. Never lean backwards in a straight chair. Before leaning back in a swivel chair, have one chair leg directly in back of the chair.
- d. Always discard tobacco ashes, matches and cigarette butts into ash trays.
- e. Clean up liquid spills immediately.

2. Precaution Against Hand Injuries

- a. Carry pens and pencils point down in your pocket.
- b. Place your hands on handles of doors and drawers to open and close them.
- c. Never use a straight pin to fasten papers.
- d. Always use a stationery knife. Never use a razor blade. Always cut away from and not toward yourself.

3. Office Machines

- a. Turn off electric office machines before you clean them.
- b. Clean only the parts of the office machine that your supervisor authorizes you to clean.
- c. Never smoke while cleaning machines.
- d. Use only solvents furnished for the kind of machine you are cleaning.

IV. PERSONAL PROTECTIVE EQUIPMENT

A. Eye Protection

- 1. Safety glasses are furnished free of charge to all Monochem employees at the time of their employment. They must be worn at all times while inside the fenced area of the plant, excluding Administration Building, Maintenance Offices, Personnel and Safety Building, Change House and lunch rooms, and walkway between same. Prescription glasses are furnished to all Monochem employees who need corrective lens. The only cost to the employee is the prescription obtained from the doctor which is to be returned to the Safety Office. The issuing of plain type safety glasses is handled through the Warehouse. Prescriptions and the repair of safety glasses are handled through the Safety office.

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2. Safety Goggles and Face Shields

- a. Cover type goggles or face shields must be worn when handling liquid or flake type corrosive materials, or when working on lines, valves or pumps containing, or having contained, such material.
- b. Face shields must be worn when using a grinding wheel.

B. Respiration Protection

There does exist throughout the plant chemicals that are of a hazardous nature. It is possible to have atmosphere of varying degrees of danger from the presence of dust, smoke, chemicals, fumes or toxic vapors. Respiratory protection is available for these conditions. It must be remembered that this respiratory protection, regardless of the type, does not protect from toxic chemicals that may be absorbed by or injurious to the skin. Both the manufacturer of respiratory protection and OSHA state that long facial hair interferes with the sealing edge of face mask and shall not be worn if these conditions exist.

1. Scott Air Pak

Provides breathing air from portable compressed air cylinder which is carried strapped on the back. The mask has a full vision face piece with impact resistant lens. The supply of air will last approximately 15 minutes. This time will vary dependent on the user. This mask may be worn in any toxic atmosphere.

2. Portable Fresh Air Mask

A continuous flow of fresh air is provided by use of a portable air filter and regulator which filters process instrument air and reduces it to a safe breathing pressure. This mask may be worn in any toxic atmosphere.

3. Dust Respirators

For protection against dust, mist and fumes not normally considered hazardous except in large concentration. It must not be used for protection against gases, vapors, or where there is insufficient oxygen.

4. Full Face Canister Mask

Filters gases of low concentration from air that contains an adequate supply of oxygen. Each canister provides approximately 20 minutes protection from acid gases and organic vapors such as chlorine when concentrations do not exceed 1%.

This mask contains no supply of oxygen as air. It merely acts as an air filter. It must not be used for work in any enclosed areas or where there is a shortage of oxygen.

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C. Safety Belts

Safety belts shall be used as a safeguard for workers employed on scaffolds, sloping roofs, or other elevated positions where footing is insecure. Only belts and safety lines that are in good condition will be used. Inspect each before using.

D. Head Protection

Safety hats must be worn when in the fenced area of the plant. Non-conducting hard hats must be worn by all men who work on or around electrical facilities.

E. Acid Suits

Acid suits will be used when loading or unloading acid or corrosive materials. These are available in the VCM area and at the boiler house.

F. Safety Showers

You must know the location and operation of the safety showers and eye baths in your work area. You should check and flush the nearest shower or eye bath before performing work involving possible exposure to corrosive or toxic materials.

G. Ear Protection

Ear protection is required in all areas where noise is above the 90 DBA standard. All operating areas that have specific areas of noise are posted with this sign, "Hearing Protection Required in This Area."

V. FIRST AID

- A. First aid facilities are maintained for the purpose of first aid treatment to injured employees. For your protection, have each injury, no matter how small, treated by the first aid attendant.
- B. First aid service is available around the clock. A Registered Nurse is in attendance at our First Aid room in the Personnel and Safety Building during the regular work week from 7:30 a.m. to 4:00 p.m.
- C. A qualified and thoroughly trained Guard is available during all other hours at the Main Gate. In addition, each operating shift has trained First Aid personnel available.
- D. First Aid assistance or ambulance service may be obtained by dialing telephone extension 129, 130 or 134. Give the exact location and make sure you are understood before hanging up.

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- E. An employee must not treat an injury. Emergency or First Aid measures such as controlled bleeding, artificial respiration, washing off chemicals, and flushing the eye are not considered as treatment.
- F. Injured employees must continue reporting for treatment until advised that no further care is necessary.
- G. Report to the First Aid Department before seeing your personal physician, or any other doctor, about an industrial injury. This shall be done to secure proper authorization if it becomes necessary to see the doctor after you have left the plant. This notification is especially important because of the nature of some chemicals and gases, and the individual's possible reaction to them. A non-industrial physician may not recognize these symptoms and fail to give proper treatment.

VI. GENERAL HEALTH

In case you begin to feel ill on the job, do not continue to work. Report to your Foreman or Supervisor and then get medical care.

It is important to come to work well rested and with a good breakfast. Fatigue caused by lack of sleep or food decreases efficiency and is a factor in many accidents.

Keep toilets, washrooms, drinking fountains, and locker rooms neat, sanitary and attractive.

It is a good idea to wash your hands when you finish a job, especially before eating. The Company provides a mild, yet effective soap. Wash your hands frequently, especially after handling chemicals, oils and solvents. Do not wash hands in gasoline or solvents as they can cause serious skin ailments and internal poisoning.

VII. FIRE PROTECTION

A. General

- 1. Fire extinguishing equipment is maintained by the Company for protection against all types of fires that may occur.
- 2. Portable fire extinguishers and other fire equipment are provided where needed at access points throughout the plant. A fire truck and extra equipment for fire fighting is maintained at the Main Gate.
- 3. You are to become familiar with the location and operation of all fire fighting equipment in your work area.
- 4. To insure maximum protection, fire fighting equipment should be readily available at all times. Aisles to all fire equipment

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should be left open. Never park cars, trucks or other equipment within 10 feet of fire hydrants or hose houses.

5. Fire extinguishers are not to be used for any purpose other than fire fighting.
6. After using any type of fire equipment, the user must report it to his supervisor. This is very important if a dry chemical is used, since it has to be recharged before it can be used again.
7. CO₂ extinguishers should be used with caution inside buildings, vessels or enclosures. If any difficulty in breathing is noticed, you should leave the area immediately.

B. Portable Fire Extinguishers

1. Carbon Dioxide (CO₂) may be used for fires in flammable liquids such as gasoline, oil or grease and for fires in electrical equipment or of electrical origin.

To operate, pull pin out and squeeze grip handle. Lasts about 35 seconds with a discharge range of 6-8 feet.

2. Dry chemical may be used on any type fire, including electrical.

To operate, pull out pin, push down plunger and squeeze handle or nozzle. Lasts about 30 seconds with a discharge range of 10-14 feet.

3. Dry chemical wheeled extinguisher - 150#, located in each of the operating areas. Uses: Same as (2) above.

To operate, wheel to the scene of the fire. Remove hose and nozzle from bracket. Open nitrogen cylinder valve fully. Nozzle has shutoff handle, fog or straight stream. Lasts about 2 1/2 minutes. Range is 10-18 feet, dependent upon fog or straight stream used.

C. Fixed Fire Protection

1. Hose Houses and Hydrants

- a. There are hose houses located throughout the plant. Each hose house contains 250' of 2 1/2" fire hose and nozzles. Hoses and nozzles are preconnected and arranged so hose can be stretched out and water turned on in the shortest possible time.
- b. Numbers 8, 9 and 10 hose houses also contain additional preconnected 1 1/2" hose.

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WARNING - Do not attempt to control 2 1/2" fire hose at full fire main pressure without at least three (3) men. 1 1/2" hose may be controlled by one (1) man with full fire main pressure on.

- c. There are additional fire hydrants arranged strategically throughout the plant. Additional hose for these hydrants is carried on the fire truck.

2. Sprinkler Systems

- a. There are twenty-two (22) of these systems located as follows:

- (1) Marley Cooling Tower
- (2) #1 Acetylene Cooling Tower
- (3) #1 Acetylene Refining
- (4) A & B Hortenspheres
- (5) C & D Hortenspheres
- (6) #1 Intermediate Storage
- (7) #1 VCM Refining
- (8) B VCM Reactors
- (9) Administration Building (Laboratory)
- (10) Fluor Cooling Tower
- (11) #2 Acetylene Cooling Tower
- (12) #2 Acetylene Refining
- (13) E & F Hortenspheres
- (14) #2 Intermediate Storage
- (15) #2 VCM Refining
- (16) "A" VCM Reactors
- (17) "C" VCM Reactors
- (18) Acetylene Compressor Shed
- (19) Acetylene Vacuum Compressor Shed
- (20) 171 Compressor Shed
- (21) Oxygen Plant Compressor Shed
- (22) Warehouse

Each of these systems will operate automatically in case of fire. Systems # 3, 4, 5, 6, 7, 8, 12, 13, 14, 15, 16, 17 can be tripped manually should the need arise.

b. Procedures and Precautions

- (1) Sprinkler control valves should never be closed until the foreman or supervisor in charge of the area has made an inspection of the area involved.
- (2) A man should be stationed at the valve while it is closed.
- (3) Sprinkler should be reset as soon as possible and full protection restored.

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- (4) Notify Safety Department so control valve can be resealed.

D. Fire Truck

1. This emergency vehicle is housed in its shed at the Main Gate. Extra fire fighting equipment, such as fire hose, nozzles, hose controls, and other fittings are stored on the fire truck.
2. The fire truck may be obtained by calling 134 or 126.

E. Fire Brigade

1. Each operating shift will have a fire brigade, composed of one man from each operating area, boiler plant and laboratory.
2. Fire brigade drills and training are scheduled so that each crew receives one (1) hour's training monthly.
3. The VCM Shift Foreman is the Fire Brigade Chief.

F. Fire Alarms

1. The primary alarm for a fire will be given via the red emergency telephone located in all control rooms.
2. The secondary alarm is the steam whistle located at the boiler house. The boiler house operator will, if asked by the person making the call on the emergency telephone, sound the coded steam whistle alarm. This will notify people who have not been reached by the emergency telephone.
3. The plant is divided into four (4) areas, generally conforming with an operating area or unit. The steam whistle alarm code and rendezvous point for Fire Brigade is as follows:

<u>Area</u>	<u>Whistle Code</u>	<u>Rendezvous Point</u>
Air Plant	1 long - 1 short	No. 10 Hose House
Acetylene Plant	1 long - 2 short	No. 9 Hose House
VCM Plant	1 long - 3 short	No. 8 Hose House
Power Plant	1 long - 4 short	No. 9 Hose House

Chemical Spill

Fire or Explosion Danger	4 short
All Clear	1 long

G. Fire Blankets

Fire blankets are located in each operating area for use in emergencies. Do not remove or use them for any other purpose.

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VIII. SAFETY PROCEDURES

A. Hazardous Work Permits

1. To insure maximum safety practices and procedures, no job function or action of a hazardous nature will be initiated without first obtaining a hazardous work permit. Actions requiring hazardous work permits are:
 - a. any type of welding equipment
 - b. blow torches
 - c. electric or air driven buffers, scalers or grinding wheels
 - d. electric drills, hammers or other similar tools
 - e. electric or gasoline-driven motors
 - f. sand blasting
 - g. heating lamps
 - h. photo flash equipment
 - i. portable electronic devices not rated explosion proof
 - j. motorized vehicles entry into restricted area
 - k. air impact wrenches
 - l. air drills
 - m. hand chipping tools, metal or concrete
 - n. burning of trash, grass or waste, except in designated burning area
 - o. lead or tar melting pots
 - p. entering a closed vessel or confined area.

A standby man will be located immediately outside a vessel, tower or tank car during the time an employee is inside.

A standby man may be required for any of the above jobs, but only if deemed necessary by the supervisor who issued the permit.

2. Procedure for Obtaining Hazardous Work Permits

The operating shift foreman will issue all hazardous work permits in the production areas. The operating shift foreman must inspect the area where the permit is to be issued.

3. Safety Precautions

Before a hazardous work permit is issued, a gas analysis must be made indicating that there is neither flammable or toxic gases in the area. The operating foreman will recheck the area periodically to ascertain whether conditions have changed as the work progresses.

Employees engaged in work requiring a hazardous work permit must be alert at all times for unexpected developments. If a dangerous condition arises, all work will be stopped at once, including cutting off flames and stopping all machines. Employees

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will vacate the area and work will not be resumed until conditions have been eliminated and approval for resumption of work is given by the operating foreman in that area.

B. Vessel Entry

1. A hazardous work permit for entry into a normally closed vessel will not be issued until the vessel has been satisfactorily purged of all hazardous and toxic materials and properly blanked off according to Production Department procedures.
2. Vessel entry will not be permitted until (a) the blanked off vessel has been tested for residual explosives; (b) the vessel's atmosphere is exactly 20.8% oxygen; and (c) the vessel, if in the acetylene plant, has also been tested for carbon monoxide (contained in off-gas).

WARNING: It is possible to have the oxygen content approximately at 20.8% and still be toxic and hazardous; an example of this is carbon monoxide which is dangerous at a concentration of only 1,000 ppm (or 0.1%).

WARNING: It is also possible to have the oxygen content greater than 20.8% (for example, at the oxygen or acetylene plants) and likewise be hazardous because of a possible fire.

3. Lacking a permissive minimum oxygen content, the vessel may be entered only by employees wearing either a Fresh Air Mask or Scott Air Pak. Suitable life belts and life line must be worn.
4. One man shall always be stationed outside the vessel observing the actions of those within.

IX. PROCESS HAZARDS

A. Vinyl Chloride

The exposure limit to vinyl chloride is 1 ppm. Time weighted average over an eight hour period, with an exposure of 5 ppm not to exceed 15 minutes duration. It is contended that prolonged exposure above this level will cause angiosarcoma (liver cancer), and for this reason more stringent safety precautions are necessary.

Vinyl chloride is to be considered a serious industrial hazard. Precautions should be taken to avoid leaks or spills which may provide a fire, explosion or exposure hazard. Where serious leaks or spills do occur, the special evacuation procedure should be referred to in the Disaster Manual.

In contact with the skin, vinyl chloride is irritating, and prolonged contact will result in freezing of the tissues and severe burns.

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Employees working in areas where vinyl chloride is handled and stored should become thoroughly familiar with the effects of vinyl chloride, both liquid and gas, and not only its immediate effects upon his person, but the long range effects it could have on his future physical wellbeing.

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. The correct usage of personal protective equipment available to you should be understood thoroughly by each employee.

B. Acetylene

Pure acetylene is a colorless, odorless gas slightly lighter than air. The product, acetylene gas, produced in this plant is not odorless due to the presence of small amounts of impurities. Acetylene has a very wide explosive range (2.5 -80% by volume in air) and is itself relatively non-toxic. However, exposure to high concentration of acetylene may cause headache, dizziness or unconsciousness due to lack of oxygen.

In addition to its wide explosive range, acetylene explosions are possible even in the absence of air. In the latter case, if sufficient energy is imparted to the gas to start a decomposition and form a flame front, the flame front will travel throughout the system until the supply of acetylene is exhausted or conditions become such that the flame front is no longer self-sustaining (as in a flame-arrestor). Acetylene decompositions are of two types--deflagrations, which result in a slow-moving (about 20 feet per second) flame front and produce pressures about eleven times the initial absolute pressure; and detonations, which result in a high velocity (about 6,000 feet per second) flame front and pressure up to 100 times the initial pressure. In long lines, a deflagration flame front may change to a detonating flame front.

An acetylene plant has several possible safety hazards. Hazardous gases such as acetylene, natural gas, oxygen and off gas mixtures are potentially dangerous and must be handled with caution. The following general rules should be followed at all times.

1. Report all leaks to foreman at once.
2. Abnormal operating conditions should be reported to foreman at once.
3. Operators should know the location, purpose and operation of all gas masks and other safety equipment, all fire fighting equipment and all emergency shutdown switches.
4. Caution should be exercised where there is a possibility of an off gas leak. This gas burns with a blue flame and is not visible in daylight, except for heat waves.

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5. The use of pipe, tubing, fittings, lubricants or pipe thread compounds containing copper shall not be used in the acetylene transmission system.

C. Oxygen

Oxygen is an active element which, although it does not burn, supports combustion and which combines, directly or indirectly, with all elements except the rare gases. Oxygen is colorless, odorless and tasteless. It is only slightly soluble in water and is a poor conductor of heat and electricity. Liquid oxygen is pale blue, slightly heavier than water, magnetic, non-flammable, and does not produce toxic or irritating vapors.

WARNING: Keep all combustible materials, especially oil and grease, away from oxygen. Do not permit smoking or open flames in any area where oxygen is stored or used. Do not permit organic material or flammable substances of any kind to come in contact with liquid oxygen. Some of the materials that can react violently with oxygen under certain conditions of pressure and temperature are oil, grease, asphalt, kerosene, cloth, wood, paint, tar and dirt which may contain grease or oil. Under certain conditions, mixtures of powdered organic materials with liquid oxygen can detonate.

CAUTION: When organic materials, such as those listed above are exposed to liquid oxygen, they will burn violently if ignited, even several minutes after they have been in contact with the liquid. Any clothing that has been splashed or soaked with liquid oxygen should be removed immediately and aired away from sources of ignition for at least one hour until it is completely free of oxygen.

HANDLING LIQUID OXYGEN: Always handle liquid oxygen carefully. At extremely low temperature, it can produce an effect on the skin similar to a burn. The gases issuing from this liquid are also extremely cold and can produce burns. Delicate tissues, such as those of the eyes, can be damaged by an exposure to the cold gases which is too brief to affect the skin of the hands or the face.

Never allow any unprotected part of your body to touch uninsulated pipe or vessels containing liquified atmospheric gases; the extremely cold metal may stick fast and tear the flesh when you attempt to withdraw from it.

Protect your eyes with a face shield or safety goggles (safety spectacles without side shield do not give adequate protection). Always wear gloves when handling anything that is, or may have been, in contact with

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liquid oxygen. Asbestos gloves are recommended. The gloves should fit loosely, so that they can be thrown off quickly if liquid should spill or splash into them. When handling liquid in open containers, it is advisable to wear high-top shoes. Trousers (which should be cuffless if possible) should be worn outside the shoes.

D. Off Gas

1. Uses at Monochem are:

- a. byproduct of the acetylene plant
- b. used at the boiler plant as fuel
- c. used at Borden's methanol plant
- d. used as fuel in the soot incinerator.

2. Properties are:

- a. 60.12% hydrogen
- b. 28.14% carbon monoxide
- c. 4.35% methane
- d. 4.65% carbon dioxide
- e. small amounts of acetylene, ethylene, oxygen, nitrogen, and argon.

3. Fire and Explosion Hazards:

Off gas is a highly flammable gas with a wide explosion range. Its two main properties, hydrogen and carbon monoxide, have explosive ranges of 4% to 75% and 12.5% to 74% respectively, by volume in air.

4. Fire Fighting Methods:

As with other gas fires, the advisability of extinguishing flames is dependent on conditions. Escaping gas may present more of a hazard than the fire. In any case, the flow of gas must be stopped. Flames may be extinguished with carbon dioxide, or dry chemical fire extinguishers.

5. Health Hazards:

It is very poisonous due to the high concentration of carbon monoxide present in the gas, 28.14%.

6. First Aid Treatment:

The patient must be immediately removed to an uncontaminated area. Begin artificial respiration if respiration has stopped. Give oxygen as soon as possible. Call physician.

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7. Personal Protective Equipment:

Fresh Air Mask or Scott Air Pak must be worn by employees having to enter an area with a high concentration of off gas.

E. Natural Gas

1. Uses at Monochem are:

- a. at the boiler plant to produce steam.
- b. at the acetylene plant in the production of acetylene.
- c. at the acetylene plant in the soot incinerator.
- d. in the flare stack pilots and laboratory.

2. Characteristics:

It is a colorless, odorless and tasteless gas. It is lighter than air.

3. Fire and Explosive Hazards are:

- a. very flammable and a dangerous explosive.
- b. explosive limits 5.3 to 14.00% by volume in air.
- c. auto-ignition temperature 999° F.

4. Fire Fighting Methods:

Fires may be extinguished with dry chemical and carbon dioxide fire extinguishers or with water fog. The best method, if possible, is to cut off the flow of gas. However, extinguishing a gas fire without cutting off the flow may create an explosive atmosphere. It may be preferred to allow the fire to continue, keeping the surrounding buildings and equipment cool with water spray until the gas can be cut off.

5. Health Hazard:

It is not a poisonous gas, but can be an asphyxiant if enough is present to reduce the oxygen content of the air below that which is necessary to sustain life.

6. First Aid Treatment:

Remove person to uncontaminated area. If person is not breathing, artificial respiration should be started and a physician called.

7. Personal Protective Equipment:

Fresh Air Mask or Scott Air Pak should be used by employees having to enter an area with a high concentration of natural gas.

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F. NMP Solvent

1. Use at Monochem:

At the acetylene plant as an absorbent in the purification section.

2. Characteristics:

Clear liquid, heavier than water.

3. Fire and Explosion Hazards:

Acetylene solvent will burn; however, since it has such a high flash point, it is classed as a non-flammable.

4. Fire Fighting Methods:

Fires may be extinguished with water fog, dry chemical, carbon dioxide, or foam.

5. Health Hazards:

It will cause skin irritation by its ability to dissolve natural oils. It may also cause eye irritation or burns.

6. First Aid Treatment:

The skin should be washed thoroughly with copious amounts of soap and water. Apply skin cream. The eyes should be flushed with plenty of water and a physician consulted.

7. Personal Protective Equipment:

Goggles and rubber boots should be worn in a spill area.

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