VCNet
Vinyl Chloride Safety Awareness Training

Instructed by
Clyde Strong & Associates, Inc.
College Station, Texas

March 26 - 27, 1992
March 28 - 29, 1992
Lamar University Fire School Grounds
Beaumont, Texas

CMA CHEMICAL MANUFACTURERS ASSOCIATION

VCNet
Vinyl Chloride Safety Awareness Training

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Joe Riddle Mansfield

SL 086640

Joe Riddle Consultant has own company

Clyde STRONG

AGENDA
VCNet Training Program

DAY 1 - March 26 or March 28, 1992

7:30 a.m. - 8:00 a.m.	Opening Remarks: Introductions
8:00 a.m. - 8:30 a.m.	OSHA 1910.120 (HAZWOPPER)
8:30 a.m. - 10:00 a.m.	Properties and Toxicology of Vinyl Chloride
10:00 a.m. - 12:00 p.m.	Introduction to Vinyl Tank Cars, Valves, Fittings and Leak Repairs

BILL TROTTER Dow-Plaquemine

LUNCH - Video: "Anatomy of a Crisis, Livingston, LA"

1:00 p.m. - 2:00 p.m.	Communications
2:00 p.m. - 3:00 p.m.	Personal Protective Equipment
3:00 p.m. - 5:00 p.m.	Tank Car Valve Repair Exercise

DAY 2 - March 27 or March 29, 1992

8:00 a.m. - 9:00 a.m.	Initial Response Actions
9:00 a.m. - 9:45 a.m.	Incident Command
9:45 a.m. - 10:30 a.m.	Standard Safe Operating Procedures
10:30 a.m. - 12:00 p.m.	Incident Problem Solving Session

LUNCH - Video: "Analysis of a Crisis, Livingston, LA"

1:00 p.m. - 2:00 p.m.	Past Experiences in Spill Response
2:00 p.m. - 4:00 p.m.	Spill Response Simulation Exercise
4:00 p.m - 5:00 p.m.	Critique of Exercise: Closing Remarks

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EMERGENCY RESPONSE TRAINING

TABLE OF CONTENTS

INTRODUCTION

This two-day training session will provide specific understanding of vinyl chloride monomer (VCM) hazards and methods of response for supervisors, managers and on- and off-site responders.

The program is a cooperative effort of industry, rail and public and will be presented by the prominent HAZMAT training firm, Clyde B. Strong & Associates, Inc.

Attendees will be asked to critique the effort, important to the improvement of future presentations.

VINYL CHLORIDE TRAINING PROGRAM SYNOPSIS

A. HAZWOPER Discussion - The reasons for response team training are discussed, and the requirements for emergency resp ns teams are reviewed per the OSHA 1910.120 standard.

B. Properties of Vinyl Chloride - The chemical, physical and toxicological characteristics of vinyl chloride are presented and discussed with emphasis on how these properties affect emergency response actions.

C. Introduction to Tank Cars, Valves, Fittings and Leak Re air - Tank car design a construction features will be discussed as they pertain to inyl chloride shipments, and the specific valve assemblies and appurtenances on vinyl chloride tank cars will be shown and described. Emphasis will be on common s ns approaches to valve and leak repair.

D. Communications - Devices used for effective communications and techniques will be reviewed with the participants, and an exercise will be conducted to demonstrate the necessity f good communications skills during emergency response.

E. Personal Protective Equipment - Protective clothing and respiratory protection needs for vinyl chloride response will be discussed, as well as the selection factors for th se items. The use of monitoring devices for the detection f vinyl chloride releases will a o be rev ewed.

F. Tank Car Valve Repair Exercise - A tank c fitted with yl# chloride valve assemblies will be used as a training moc.-up. Common leak problems will be simulated using air and water. Participants rotate through various stations while analyzing the leak problems and making valve repairs as appropriate.

G. Initial Response Actions - Priorities and procedures for safely initiating emergency response operations will be reviewed and discussed with the participants as these acti ns apply to vinyl chloride emergencies.

H. Incident Command - Incident Command System will be discussed as it applies to emergency response, and management procedures for effective response operations will be reviewed.

I. St ndard Safe Operating Proce es - Elements f the emergency pl and emergency operation re discussed w th emphasis on the development and use of e procedures which have been practiced and are familiar to the response team.

(cont'd)

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VINYL CHLORIDE TRAINING PROGRAM SYNOPSIS (CONT'D.)

J. Incident Problem-Solving Session - A transportation incident involving vinyl chloride will be presented through a written script and maps. Participants, in small groups, evaluate the situation, answer various questions related to the handling of the incident and deal with various problem situations introduced by the instructors. A team leader from each group will present and defend his group's answers to the class and the instructors.

K. Past Experience - Hazardous material incidents will be reviewed and discussed by the participants and the instructors.

L. Spill Simulation Exercise - Participants will organize themselves and their equipment, then respond to a simulated incident involving vinyl chloride. The objective is to utilize the information and skills obtained through the training program to handle the incident safely, effectively, and in a coordinated manner.

Note: The course schedule is very full. Please be on time.

Certification: Employers will credit record training hours t ward regulatory requirements (29CFR 1910.120) standard. A certificate of course completion training will be given trainees.

INTRODUCTION

Hazardous materials are now part of the daily lives of most people in the world. There is an ever-increasing volume of chemicals that are being produced, transported, stored, used and disposed of. It is imperative that every group charged with the responsibility for dealing with these incidents be prepared in terms of training and equipment, because it is inevitable that incidents will occur. The long term and short term consequences to human health and the environment which could result from poor decisions and inadequate response capabilities are too great to ignore.

A substance may be hazardous if it is one of the following: flammable, explosive, toxic, corrosive, radioactive, cryogenic, or readily decomposes to give off oxygen at elevated temperatures. Thousands of chemicals possess one of these properties. A very critical point which should not be overlooked in the initial identification and classification is the fact that many chemicals present multiple hazards. These multiple hazards may not be apparent unless detailed information about the chemical is obtained. When more than one chemical substance is involved in an incident there is the additional threat that chemicals may mix, resulting in a hazardous reaction or hazardous reaction product.

There are no hard and fast formulas for handling hazardous material incidents: each situation will vary. It is through the adaptation of basic principles to fit the incident at hand, the wise use of available technology and equipment, and sound management and decision-making that incidents are handled safely and successfully. The lessons learned through past experiences are invaluable and should be studied whenever possible. Training must be sound so that what is learned may be applied to actual situations and may be applied in a realistic and practical sense.

HOW TO PROTECT YOURSELF AGAINST HAZARDS

Find out as much as you can about the kinds of chemicals and other potential hazards which may be present at the work site. Know what they are and what they can do to you. For example, ask your supervisor:

- What protective clothing and equipment are required for the hazardous substances you may encounter at the work site.
- What potential explosive and/or flammable conditions may be present.
- What, if any confined spaces will you have to enter. (The air in these spaces MUST be checked for unsafe

concentrations of airborne contaminants and for sufficient levels of oxygen.)

- What emergency equipment is available, where is it located, and how to use it. (This equipment must be checked often and kept in good working condition.)

- What is the availability of standby personnel.

- What are the standard operating procedures (SOPs) for evacuation and rescue in the event of an emergency.

- If conditions or situations are likely to change during the work period, how will you be notified.

- What is the work/rest cycle for each task.

- Will the buddy system be used and who will be your buddy.

Stay out of contaminated areas if you are not properly trained, equipped, or authorized to enter. Don't take chances with life-threatening materials or situations.

WORK SAFELY

Follow your employer's standard operating procedures (SOPs) and your supervisor's instructions. Use your own senses of sight, hearing, smell, and touch - and stay alert. Many things you encounter may require procedures that you have not used on other jobs.

Remember that common sense is based on experience and training. Different problems may be encountered every day. If you don't understand and haven't been trained, ask for instructions.

Some things to remain aware of at the work site include:

- Any weather changes. For example, when it gets hot or the air is calm, chemical concentrations in the air can increase. This may require additional protection.

- Wind direction. For example, avoid dust and vapors by working upwind if possible.

EMERGENCY INFORMATION

It is important that a telephone or two-way radio be available, along with the necessary phone numbers for medical and other emergency services (for example, local rescue squad, fire and police departments.) Emergency first aid equipment and medical personnel, or someone who knows how to provide emergency first aid, should always be present and readily available at the work site. Instructions for the fastest route to the nearest hospital or medical facility should be available, along with necessary transportation equipment.

CONTAMINATION AND DECONTAMINATION

When working with hazardous wastes, it is important to establish and maintain "clean" areas at the site. Materials found in contaminated areas should be confined to specific "hot" zones whenever possible. Special decontamination zones and procedures should be used to help control the movement of hazardous materials from the "hot" zone.

You should be familiar with all decontamination procedures at your work-site and follow them carefully. After removing contaminated clothing, you should shower, wash your hair, and change into clean clothing in an uncontaminated area. Contaminated clothing or equipment should not be taken home because they could expose others to hazardous materials. Your clothing, tools, and equipment should be decontaminated and stored or disposed of according to your employers SOPs.

If spills or splashes occur while you are in a contaminated area, proceed immediately to the decontamination area and correct the problem. You may have to obtain clean protective clothing before returning to the contaminated area to continue your work.

MEDICAL SURVEILLANCE PROGRAM

Medical surveillance is an important part of an occupational health and safety program. It is a way of keeping track of your health through the use of preplacement and periodic medical examinations and laboratory tests. This medical surveillance program will help your doctor to :

- Determine a base-line picture of your health against which future changes can be measured.
- Identify any underlying illness or conditions which might be aggravated by certain exposures to job activities.
- Recognize any abnormalities, toxic reactions, or other changes in your health at the earliest opportunity so that corrective measures can be taken.

The medical records developed as part of the medical surveillance program are important aids to your doctor should you develop health problems which may be associated with exposure to hazardous substances. When abnormal conditions are discovered early enough, appropriate action to correct these and/or prevent more serious conditions can usually be taken.

O | bvious
S | udden
H | EAT
I | NduCED
T | EAR

Operations just before blast occurred. Newsmen and others without protective clothing were seriously burned when the tank ruptured.

Vinyl Chloride Blast

by Terry C. Hayes, NFPA Fire Service Specialist

Rupture of fire-involved railroad tank car kills one man, decimates command officers and fire attack teams

Incident Development

ON OCTOBER 19, 1971 officers and men of the Houston, Texas Fire Department were stunned and injured by a violent blast from a fire-involved railroad car containing vinyl chloride. The fire companies had responded to a train wreck and were attempting to direct cooling streams on the critical part of the fire. When the explosion occurred, four chief officers in command at the scene and twenty-one company officers and fire fighters were knocked out of action. One training officer was killed, fourteen other men were injured and a fire department pumper was destroyed. Five newsmen were also taken to a hospital with burns or other injuries.

Like previous fire tragedies, this incident brought a number of lessons to the Fire Service, most important of which is this: when hazardous chemicals are involved or exposed to fire, treat them with maximum respect! In this incident, except for the miraculous quirks of good fortune, many other persons might have died.

At approximately 1:40 p.m., on that day, Missouri Pacific freight train 94 entered the city limits of Houston, Texas, moving eighty-two cars of freight from the coastal region, the heart of the Petro Chemical Complex in that area.

At 1:46 p.m., the alarm office of the Houston Fire Department was flooded with telephone calls from persons reporting a fire and explosion in the vicinity of Almeda Genoa Road and Mykawa Street at the railroad tracks.

First fire department units dispatched acknowledged at 1:47 p.m. that they were responding. They arrived at the scene and reported at 1:51 p.m. a train derailment and several railroad cars on fire. The first arriving chief officer asked for two additional pump companies.

Fire fighters prepared to direct hose streams on exposed tank cars to keep them cool and, hopefully, prevent further pressure buildup and fire involvement. Getting water on these tanks was not easy; the nearest fire hydrant was over six-tenths of a mile away. To get this relay completed, the district chief called for second alarm response.

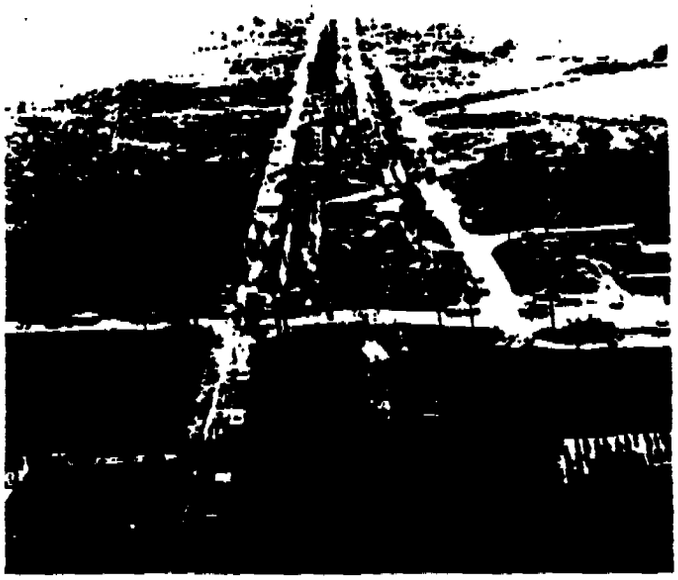
The area was sparsely settled with about thirteen inhabited dwellings and small businesses located in one-half square mile. These persons were evacuated by police, but the black smoke could be seen for miles and spectators flocked to the scene adding to the problems of the emergency forces.

An aerial ladder was raised and a ladder pipe was placed in service using two 2½-inch hose lines to cool the exposed tanks. The pipe was set up to be operated manually or remotely from the aerial. Meanwhile, an attempt was being made to bring water in from the next hydrant, over a mile away.

At 2:08 p.m., three additional pumpers were requested by the Chief Officer at the scene and at 2:20 p.m. an additional pumper was dispatched making a total of 15 pumpers and men, plus support units to combat the fire that was becoming more intense by the minute.

At 2:28 p.m., (approximately one minute before explosion) Fire Chief C. W. Cook enroute to the scene asked the officer in charge, by radio, if he knew the content of the tank cars involved. The response was "We've had two reports, one of ethyl chloride, the other methyl chloride. We do not know for sure. There is also caustic soda involved."

At 2:29 p.m., or 43 minutes after the first report to fire alarm headquarters, and 38 minutes from the time



View of Mykawa Road before the blast. Cr[illegible] left has a monitor nozzle in position and are waiting f[illegible]ter. Relay was more than a half-mile.

(Left) Aerial view of train wreck after fire and blast. Apparatus and tank cars are on road at left. (Sketch on page 97.)

of arrival of first-in fire companies, one of the tank cars ruptured violently creating a large fire ball. (Witnesses stated the fire ball was more than 1,000 feet in diameter.) The surrounding area was showered with parts of tank cars, rocks, cross ties and flying debris caught up with the massive release of energy. The ruptured tank was later identified as a 48,000 gallon tank car of vinyl chloride.

Most of the firefighters had just enough time to turn and run because of an accelerated buildup of the fire just seconds prior to the rupture. As a result, most of their burns were received on backsides and hands. However, Andy Nelson, who had helped set up the ladder pipe, had climbed back to the nozzle before the rupture and was caught on top of the ladder with the full force of the fire ball and blast. Half on his own power and half falling, he made it down the ladder and was helped to an ambulance by fellow firefighters. His bunker coat was in shreds, his hip boots showed signs of melted rubber, his helmet badly charred and he was in critical condition, but alive. Truston J. Hathaway, recently assigned to the training division of the fire department, was killed in the mishap.

All available ambulances were rushed to the scene. The fire chief arrived to find his assistant, deputy and two district chiefs, three captains, four chauffeurs, ten pipe and ladder men, chief mechanic, chief of special services, one investigator, [illegible] one fire inspector out of action and on their way [illegible]he hospital, along with five newsmen.

There was still a major fire to be fought. Chief Cook regrouped his men, sent for additional help and equipment and at 6:57 p.m. the fire was tapped out.

A survey of the scene revealed the following: one firefighter dead, twenty-five injured and taken to hospitals along with five newsmen; fourteen injured but remaining at the scene; one fire department pumper destroyed along with a two-ton truck; one station wagon; sixteen rail cars either destroyed or heavily damaged along with their cargoes of butadiene, vinyl chloride, acetone, fuel oil, styrene and caustic soda. Property damage has been estimated at $376,204 excluding damage to track and road bed. (An investigation and hearing regarding th[illegible] incident was conducted by the National Transpor[illegible]tion Safety Board to try and determine the cause of the derailment and reason for loss of life and injury to persons involved. The outcome of this hearing should receive study by all parties concerned.)

Lessons to be Considered

It is worth reviewing certain fundamentals of tactics and training. Most principles of fireground safety and effective operations are developed from past fire experience and analyses of lessons learned. This Houston incident demands the same attention.

First, how many fire officers and fire fighters have ever witnessed a fire ball over 1,000 feet in diameter with an estimated temperature in excess of 3000 degrees Fahrenheit? How many have seen a tank rocket along the ground or through the air, perhaps for a quarter-mile or more?

Frequent experience in combating str[illegible]ural fires and in training probably has taught them t[illegible]reality of certain dangers peculiar to structural fires. But what experience has a department had in combating a fire of the magnitude mentioned in this article? (Three

(continued on page 96)

chief officers of the Houston Fire Department with a combined total of 75 years service testified that they had never faced a situation like the derailment fire before.)

Without experience to handle an incident of this type, officers and fire fighters must rely on knowledge obtained during training exercises to help in decision making at the scene of the real thing. This is the second part of the problem. How much drill field time has the average fire department logged in training for this type of incident? If we exclude that training given crash and airport protection personnel in fighting flammable liquid spill fires, we will possibly find there has not been enough time spent in training the rest of the department. The reason: very few departments have adequate facilities to give all personnel this type of training.

For those men who have received training in handling flammable liquids and liquefied gas fires, was the training realistic? Safety demands that this type of training be conducted under "ideal" conditions. The training field is isolated away from the general public. We know the commodity involved, we know the condition of the container. The relief valve is in an upright position, we have adequate manpower to launch an attack and give protection from back up lines on the attack force. We have adequate water to accomplish what we have started, whether it be to shut off the flow of fuel or cool exposed tanks. Usually all the fire is visible and can be reached with hose streams. The men are wearing full protective clothing.

How different is the real thing. Many times the commodities involved are unknown, and are not compatible with one another. Some may be reactive with water. The condition of the tank or tanks may be unknown; the tank may be upside down causing the relief valve to be in liquid rather than the vapor area. If the wreckage is on fire, concealed flames may be impinging on concealed portions of the tank. If the alarm was delayed, we have no way of knowing how long the tank has been involved in fire and how much internal pressure has built up prior to arrival of fire personnel

With all these unknowns, how can an officer make an intelligent decision utilizing the limited experience and training he has had? The three reference books used most by the Fire Service that should be standard equipment to help in the decision making are: *Fire Protection Guide on Hazardous Materials*, published by NFPA, *Chemcard Manual* published by the Manufacturing Chemists Association, and *Dangerous Articles Emergency Guide* by the Bureau of Explosives; also, assistance can be obtained by telephoning Chemical Transportation Emergency Center (800)424-9300. (See article, page 4).

Let's consider the fire fighting recommendations for "Vinyl Chloride" in all three manuals.

The *Hazardous Materials Guide* states:

"Firefighting Phases: stop flow of gas, use water to keep fire exposed containers cool and to protect men affecting the shut-off. Wear self contained breathing apparatus."

The *MCA Chemcard Manual* states:

"If vinyl chloride is on fire, Do not put out fire unless leak can be shut off immediately. On small fire, use dry chemical or carbon dioxide. On large fire, use water spray or foam. Wear self contained breathing apparatus. Cool tank with water if exposed to fire."

The Bureau of Explosives, *Dangerous Articles Emergency Guide* states:

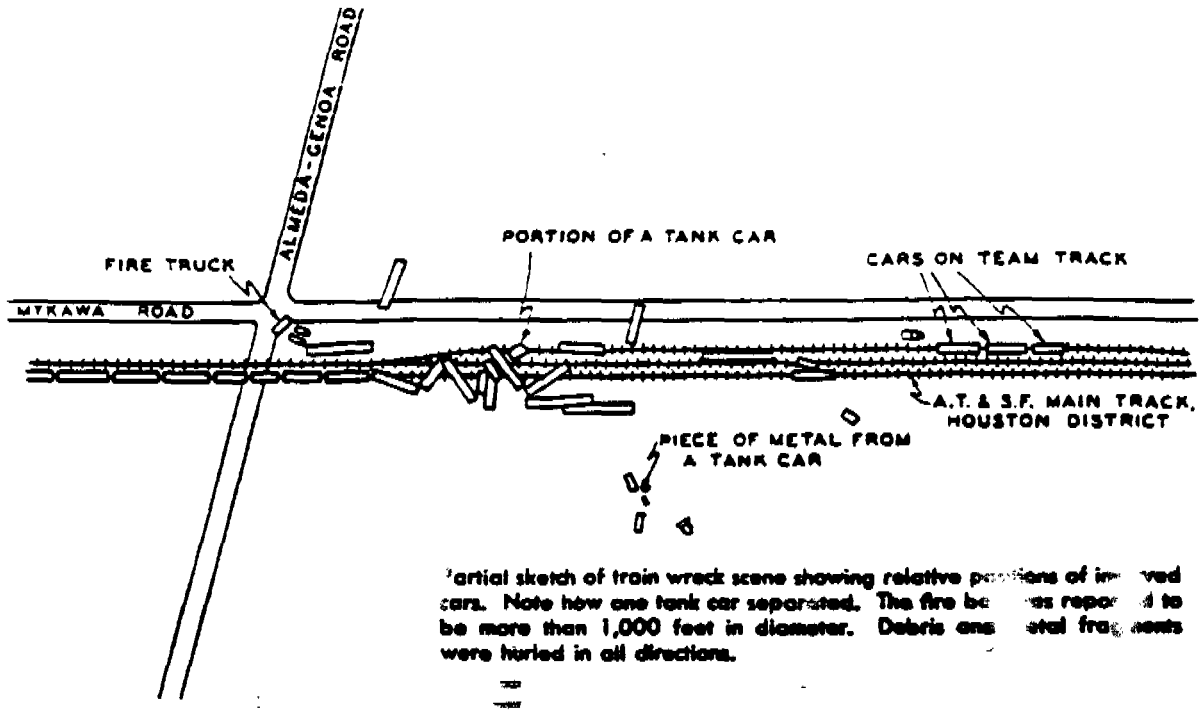
"If vinyl chloride is on fire do not extinguish fire unless gas flow can be stopped. Cool all affected containers with large amounts of water." It further states, "If it appears that fire can be controlled, get away but don't evacuate — put hoses on stands etc. If large quantities involved evacuate for radius of 1600 feet if fire (or reaction) becomes uncontrollable."

The three manuals recognize that stopping the flow of gas before extinguishment and cooling the affected tanks is an acceptable technique in handling vinyl chloride fires. Certainly this technique has worked in some transportation fires as well as fixed installations. At Glendoria, Mississippi, a derailment occurred September 11, 1969 and a tank car of vinyl chloride was exposed to fire for about ten hours before violent rupture occurred. In its analysis of the incident, the National Transportation Safety Board concluded that cooling the tank with water spray during the ten-hour interval would have prevented the explosion.

When Do You Withdraw?

Based on experience of past incidents involving train derailment, we must realize that some fires cannot be controlled or contained regardless of action taken by the attack force. Therefore, for these dangerous incidents no controlling action should be taken unless it can be done from protected locations and operated remotely. Due to the many unknown factors involved, no one as yet has been able to determine just when the decision of attack or not attack can be made intelligently. This decision is still left to the officer in charge and he makes that decision based on his experience and training.

Are firefighters psychologically prepared to make such a decision? Since the days of Benjamin Franklin, fire department training has been geared to "advance and



Partial sketch of train wreck scene showing relative positions of involved cars. Note how one tank car separated. The fire became reported to be more than 1,000 feet in diameter. Debris and metal fragments were hurled in all directions.

extinguish." Seldom has a program of tactical retreat or no-advance been incorporated with other fire fighting procedures at the drill field. Consequently, when the officer is faced with the decision of attack or not to attack, his first thought will be to attack regardless of how reluctant he may feel about the decision.

What can be used as a criteria for determining when to attempt to control the fire or let it burn? For the moment, allow us to set aside the size of the fire involved. (As yet, no one has defined what is considered to be a small, moderate or large fire). Allow us to consider first what is at risk. How many people within 100, 200, 500, 1,000 or 2,000 feet and beyond? How fast can these people be removed? After life safety is considered, critical property comes next, such as possible contamination of a city's water supply, or blast effect on a dam holding the water, exposed power plants and similar property. If our survey reveals no risk to protect or that persons and things can be removed, then why should the fire department become the risk?

If the derailment and fire occurs in a heavily populated area, then the attack force has little choice but to go in with all the cooling streams available (if the product is not reactive to water) to try preventing that violent rupture long enough to get the people removed from the danger area. However, efforts should be made as quickly as possible to set up unmanned hose streams and withdraw firefighters to a safe location.

What is a safe distance? Keep in mind that witnesses have testified and photographs indicate that the fire balls accompanying rupture exceed 1,000 feet in diameter. At Laurel, Mississippi, a 37-foot section of a tank car was hurled over 1,600 feet. The Bureau of Explosives Guide lists certain distances for evacuation when certain commodities are involved in fire. These should be considered as minimum distances to an exposed tank car. No one should be allowed inside this area without protective clothing and this includes everyone regardless of rank, or whether they are newsmen or officials.

Only the fire problem of train derailments has been discussed in this article. There are other problems such as spill of hazardous vapor or chemical with no fire involvement. The purpose of this article is to alert each department to problems encountered by others and to encourage action to prepare for such incidents.

Much has been said about the difficulty of preplanning transportation incidents. While this is true, several things can be done. Preplan evacuation procedures of track and highway areas; locate those areas where water is sufficient to supply adequate cooling streams.

Incorporate into your training program a system of immediate alert and retreat of all personnel at a fire scene.

Give serious thought to the attack or no attack approach to these incidents.

Establish communications between your department and rail and truck officials in your area.

Make thorough study of placards used to identify hazardous cargo in transit.

Ask to see dangerous article shipping papers carried on trucks in your area handling hazardous materials; find out from rail officials where the manifest list is carried in the train caboose.

Work out a system of identifying the conductor of the train, this will eliminate much confusion if done prior to derailment.

Have available reference material as mentioned to assist in decision making.

Post the phone number of CHEMTREC in the alarm office and other key locations. (See page 1).

Above all, don't think it can't happen to you and your department.

Properties and Toxicology

of

Vinyl Chloride

All substances are poisons;

There is none which is not a poison.

The right DOSE differentiates

a poison and a remedy.

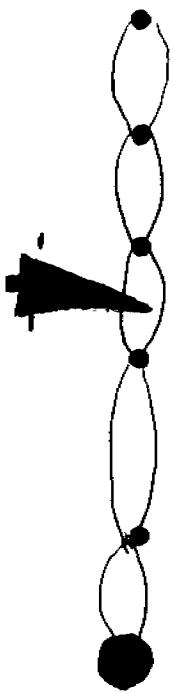
Paracelsus (1493-1541)

Items to be Covered

- Historical Information
- Brief overview of VCM Standard (29 CFR 1910.1017)
- MSDS
- Questions

FWK 4/8/91

History of VCM



- First experimentally made by REGNAULT in 1835
- Used as an anaesthetic
- Used to manufacture PVC in Germany during the 1920's
- Introduced to the US during WW II to act as Rubber substitute
- BFG notified OSHA - Angiosarcoma, 1974
- 1974 - Search found 18 cases in US
  20 cases in all other countries

SIL 086655

FWK 4/8/91

Fire Fighting Summary

- SMALL FIRES
  - Attempt to close source of leak
  - Extinguish with Carbon Dioxide or Dry Chemical
  - Cool surrounding equipment

- LARGE FIRES
  - If safe, attempt to close source of leak
  - No known extinguishing agent may use foam, fog spray
  - Cool surrounding equipment to avoid tank rupture
  - Allow fire to self-extinguish

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Special Precautions

VCM is shipped in tank cars as bulk
CAS# 75-01-4
UN 1086

- Electrical grounding is needed to avoid static discharges
- Avoid contact with flames, hot surfaces
- Do not use in poor ventilated/confined areas
- VCM must be labeled properly

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Special Protection
(cont'd)

- Use boots, aprons, chemical suits to prevent skin contact

- Use 29 CFR 1910.134 as guidance for proper respiratory requirements
- Use 29 CFR 1910.132 and 1910.133 for guidance in the use of protective clothing and equipment

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Special Protection

- In case of fire use full Bunker Gear
- Pressure - demand supplied air
- Inside building use exhaust
- Use chemical safety goggles or full face piece respirator
- Use Nitrile or North Silver Sheet gloves

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Spills - Leaks

Evacuate area from non-essential personnel

Remove sources of ignition, provide ventilation

Use SCBA full face piece

Airline supply

If VCM over 36,000 PPM entry for securing equipment and life rescue only

- Close - off source of leak

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Emergency / First Aid
(cont'd)

Skin Contact

- wash with water
- followed by soap and water
- low boiling point/evaporation causes
  - frostbite
- warm affected area with lukewarm water

Ingestion

- not likely

A physician should be consulted

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Emergency/First Aid

- Inhalation
  - remove to fresh air
  - if not breathing, give artificial respiration (mouth-to-mouth preferred)
  - difficulty breathing, use Oxygen

- Eye Contact
  - flush with water for at least 15 minutes

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Effects of Overexposure

ACUTE	- Inhalation	Dizziness, unconsciousness, lung irritation
	- Skin/Eye	Freezing of exposed tissue
CHRONIC	- Cancer	Angiosarcoma
	- Skin	Scleroderma
	- Fingerbones	Acroostiolysis
	- Others	Blood, Nervous System

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Toxicity Data

- Listed as a Carcinogen
  OSHA, NTP, IARC
- HUMAN DATA (Inhalation)
  TCLo (5 years, male) reproductive - 30mg/ cu m
  (about 23 PPM)
  TCLo (14 years) liver - 200 PPM
- TCLo = Lowest published toxic concentration
- NTP = National Toxicology Program
- IARC = International Agency for Research on Cancer

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Reactivity Data

- Generally stable if under Pressure
- Will polymerize if exposed to light
- Air will form Peroxides causing explosive polymerization of the Chloride
- Will explode on contact with oxides of Nitrogen
- Incompatible with Copper and Aluminum

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Fire Procedures

- Evacuate Area
- Consider VCM is heavier than Air
- If possible, Turn off source
- For Cargo Fires evacuate 1/2 Mile Radius - Explosion
- Down Wind may require further Evacuation - Toxic Gases

Cool surrounding Containers - Heat Structural Damage

If the Source cannot be turned off, allow fire to continue burning

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Fire Hazard Data

Flash Point (Open Cup)	- 108 Deg. F
Lower Explosive Limit (LEL)	3.6 %
Upper Explosive Limit (UEL)	33 %
Combustion Products	Hydrogen Chloride (HCl) 52% Carbon Monoxide (CO) 49% small amounts of Phosgene 15ppm

FWK 4/8/91

Physical Properties

Boiling Point @ 760 mm	7 Deg. F
Vapor Density (Air = 1)	2.15
Specific Gravity (Water = 1)	0.9121 @ 20/4 Deg. C
Freezing/Melting Point	- 245 Deg. F
Solubility (% Weight in Water)	0.11% @ 77 Deg. F
Bulk Density	approx. 7.59 Lbs/Gal
Vapor Pressure	49.89 psi @ 20 Deg. C or 2580 mm of Hg @ 20 Deg.
Appearance/Odor	Clear,Colorless Mild,Sweet Odor

FWK 4/8/91

MSDS Overview
(cont'd)

- Health Hazards
  - Toxicity Data
  - Effects of Overexposure
  - Emergency/First Aid

- Emergency Response
  - Spills - Leaks
  - Special Protection
  - Special Precautions

FWK 4/8/91

MSDS Overview

- Consists of 8 to 10 Sections

- General Information
  - Name, CAS#
  - Manufacturer Name, Telephone Number
  - Synonyms

- Physical Data
  - Properties
  - Fire/Explosion Hazard
  - Reactivity Data

FWK 4/8/91

OSHA VCM Standard
(29 CFR 1910.1017)

- December, 1974 - Emergency Interim 50 PPM TWA
- April, 1975 - Final 1 PPM 8-hr TWA
  5 PPM STEL
  0.5 PPM Action Level
- Exposure without regard to respiratory protection
- Must have Regulated Areas if TWA above 1 PPM
- Engineering, Respiratory Protection, Work Practice
- Training
- Medical Surveillance

FWK 4/8/91

Regulatory Requirements

OSHA	29 CFR 1910.1017
EPA	NESHAP
EPA	CERCLA (RQ 1 LBS)
EPA	SARA - Title III
EPA	TSCA
EPA	RCRA
NEW JERSEY	Community RTK
CALIFORNIA	Proposition 65

FWK 4/8/91

History of VCM
(cont'd)

Mostly Reactor Cleaners with 18 years exposure

1989 - 144 cases world wide with average exposure of 26 years

1956-1989 = 33 years 144 cases -- NO EPIDEMIC

Safe levels - OSHA settled for 1 PPM 8-hr TWA

1 PPM = 1 oz Vermouth in 7812.5 gal of Gin
1 sec in 11.57 days
1 inch in 16 miles

FWK 4/8/91

PPGI 98
PPG INDUSTRIES, INC.

VINYL CHLORIDE (VCM)
PAGE: 1

MSDS NUMBER:	0129
DATE:	01/25/91
EDITION:	006
TRADE NAME:	VINYL CHLORIDE (VCM)
CHEMICAL NAME/SYNONYMS:	VINYL CHLORIDE MONOMER, CHLOROETHYLENE, CHLOROETHENE
CHEMICAL FAMILY:	CHLORINATED HYDROCARBON
FORMULA	$CH_2 = CHCL$ CAS NUMBER: 000075 01 4
U.S. DOT SHIPPING NAME:	VINYL CHLORIDE
U.S. DOT HAZARD CLASS:	FLAMMABLE GAS
SUBSIDIARY RISK:	N/A
I.D. NUMBER:	UN1086
REPORTABLE QUANTITY:	1 LB.

SECTION 1 - PHYSICAL DATA

BOILING POINT @ 760 MM HG:	7 F
VAPOR DENSITY (AIR=1):	2.15
SPECIFIC GRAVITY (H20=1):	0.9121 @ 20/4 C
PH OF SOLUTIONS:	APPROX. 7
FREEZING/MELTING POINT:	-245 F (-153.7 C)
SOLUBILITY (WEIGHT % IN WATER):	0.11% @ 25 C (77 F)
BULK-DENSITY:	APPROX. 7.59 LBS/GAL
VOLUME % VOLATILE:	100%
VAPOR PRESSURE:	2580 MM HG @ 20 C
EVAPORATION RATE:	(ETHYL ETHER=1): < 1
HEAT OF SOLUTION:	N/A

APPEARANCE AND ODOR:
CLEAR, COLORLESS, LIQUIFIED GAS UNDER PRESSURE; MILD, SWEET ODOR

SECTION 2 - INGREDIENTS

MATERIAL	PERCENT
VINYL CHLORIDE MONOMER	100

SECTION 3 - FIRE/EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): -108 F (CLEVELAND OPEN CUP) (-78 C)
FLAMMABLE LIMITS IN AIR (% BY VOLUME)
LEL: 3.6%
UEL: 33%
EXTINGUISHING MEDIA: CARBON DIOXIDE OR DRY CHEMICAL FOR SMALL FIRES.

SPECIAL FIRE FIGHTING PROCEDURES:
FOR ANY VCM FIRE, IMMEDIATELY EVACUATE AREA. VINYL CHLORIDE GAS IS HEAVIER

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THAN AIR. ONLY FIREFIGHTERS EQUIPPED WITH PRESSURE DEMAND, SELF-CONTAINED BREATHING APPARATUS SHOULD BE ALLOWED IN AREA. USE WATER SPRAY TO COOL EQUIPMENT. (ALSO SEE COMMENTS AT END OF MSDS)

UNUSUAL FIRE AND EXPLOSION HAZARDS:
BURNS TO FORM TOXIC AND CORROSIVE GASES, MOSTLY HYDROGEN CHLORIDE.

SECTION 4 - HEALTH HAZARD DATA

TOXICITY DATA:

LC50 INHALATION:	SEE SECTION 5
LD50 DERMAL:	SEE SECTION 5
SKIN/EYE IRRITATION	SEE SECTION 5
LD50 INGESTION:	SEE SECTION 5
FISH,LC50 (LETHAL CONCENTRATION)	UNKNOWN

CLASSIFICATION (POISON, IRRITANT, ETC.)

INHALATION:	SEE SECTION 5
SKIN:	SEE SECTION 5
SKIN/EYE:	SEE SECTION 5
INGESTION:	SEE SECTION 5
AQUATIC:	UNKNOWN

SECTION 5 - EFFECTS OF OVEREXPOSURE

THIS SECTION COVERS EFFECTS OF OVEREXPOSURE FOR INHALATION, EYE/SKIN CONTACT, INGESTION AND OTHER TYPES OF OVEREXPOSURE INFORMATION IN THE ORDER OF THE MOST HAZARDOUS AND THE MOST LIKELY ROUTE OF OVEREXPOSURE.

IS CHEMICAL LISTED AS A CARCINOGEN OR POTENTIAL CARCINOGEN?
NTP - YES IARC - YES OSHA - YES

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:
PROLONGED EXPOSURE TO HIGH CONCENTRATIONS OF VINYL CHLORIDE MAY COMPLICATE EXISTING LIVER, SKIN AND BONE DISEASE.

PERMISSIBLE EXPOSURE LIMITS:
OSHA: 1 PPM, 8-HOUR TWA (TIME-WEIGHTED AVERAGE); 5 PPM AVERAGED OVER ANY 15 MINUTE PERIOD, STEL (SHORT-TERM EXPOSURE LIMIT); ACTION LEVEL - 0.5 PPM, 8-HOUR TWA; 29 CFR 1910.1017.

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ACUTE:

INHALATION: ACUTE INHALATION OVEREXPOSURE TO VINYL CHLORIDE CAN CAUSE LUNG IRRITATION, DIZZINESS, AND UNCONSCIOUSNESS FOLLOWING SHORT-TERM EXPOSURE.

SKIN/EYE: SKIN AND EYE CONTACT WITH THE LIQUID MONOMER CAN CAUSE FREEZING OF EXPOSED TISSUES BECAUSE OF LOW STORAGE TEMPERATURES REQUIRED FOR

THIS PRODUCT.

CHRONIC:
VINYL CHLORIDE HAS BEEN DEMONSTRATED TO BE A HUMAN CARCINOGEN. OCCUPATIONAL EXPOSURES TO VINYL CHLORIDE MONOMER HAVE BEEN ASSOCIATED WITH A VARIETY OF HUMAN DISEASE CONDITIONS. AMONG THESE ARE LIVER LESIONS, INCLUDING FIBROSIS AND CANCER (ANGIOSARCOMA AND OTHER CANCERS OF THE LIVER AND BILIARY TRACT), SKIN CONDITIONS (SCLERODERMA), AND SHORTENING OF THE FINGERS (ACROOSTEOLYSIS). OTHER ABNORMALITIES LINKED WITH VINYL CHLORIDE MONOMER EXPOSURES INCLUDE SPLEEN, LUNG, BLOOD, AND NERVOUS SYSTEM ABNORMALITIES (INCLUDING CANCER OF THE BRAIN AND OTHER CNS PARTS). IN A RECENT DRAFT REPORT ENTITLED "EPIDEMIOLOGIC STUDY OF VINYL CHLORIDE WORKERS," THE STUDY FOUND A MORTALITY EXCESS IN EMPHYSEMA, HOWEVER, THE STUDY DID NOT FIND ANY EXCESS IN EITHER RESPIRATORY CANCER OR LYMPHATIC AND HEMATOPOIETIC CANCER.

EMERGENCY AND FIRST AID PROCEDURES

INHALATION:
REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION, PREFERABLY MOUTH-TO-MOUTH. IF BREATHING IS DIFFICULT, GIVE OXYGEN. CALL A PHYSICIAN.

EYE OR SKIN CONTACT:
EYE CONTACT - FLUSH IMMEDIATELY WITH WATER FOR AT LEAST 15 MINUTES. CALL A PHYSICIAN. SKIN CONTACT - WASH WITH WATER, THEN SOAP AND WATER WHILE REMOV ING CONTAMINATED CLOTHING AND SHOES. VINYL CHLORIDE'S RAPID EVAPORATION RA CAN PRODUCE FROSTBITE. FOR FROSTBITE, DO NOT RUB BUT WARM AFFECTED AREA BY PLACING IN LUKEWARM WATER. EXERCISE AFFECTED AREA AFTERWARDS. GIVE PATIEN WARM DRINK. IF IRRITATION PERSISTS, CONTACT A PHYSICIAN. THOROUGHLY CLEAN CONTAMINATED CLOTHING BEFORE REUSE OR DISCARD.

INGESTION:
NOT APPLICABLE.

NOTES TO PHYSICIAN (INCLUDING ANTIDOTES):
IT SHOULD BE NOTED THAT ENZYMATIC LIVER FUNCTION TESTS ARE NOT ABNORMAL IN INDIVIDUALS WITH VINYL CHLORIDE-ASSOCIATED LIVER LESIONS. ALTERNATE DIAGNOSTIC PROCEDURES ARE REQUIRED.

SECTION 6 - REACTIVITY DATA

STABILITY: STABLE
CONDITIONS TO AVOID: OXYGEN, MOISTURE, POLYMERIZATION INITIATORS, COPPER, ALU
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR (NORMAL COND)
CONDITIONS TO AVOID: NONE
INCOMPATIBILITY (MATERIALS TO AVOID):
OXYGEN, MOISTURE, POLYMERIZATION INITIATORS, COPPER, ALUMINUM
HAZARDOUS DECOMPOSITION PRODUCTS:

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HYDROGEN CHLORIDE, CARBON MONOXIDE, AND POSSIBLE TRACES OF PHOSGENE

SECTION 7 - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS SPILLED OR RELEASED:

IMMEDIATELY EVACUATE AREA, REMOVE ALL SOURCES OF IGNITION AND PROVIDE MAXIM VENTILATION. ONLY P NNEL EQUIPPED WITH NIOSH/MSHA-APPROVED, SELF-CONTAIN BREATHING APPARATUS FULL FACE PIECE, AIRLINE RESPIRATORS WITH AUXILIARY SCBA'S OPERATED IN PRESSURE-DEMAND MODE AND SKIN/EYE PROTECTION SHOULD BE ALLOWED IN AREA. CLOSE OFF SOURCE OF LEAK AND ALLOW ALL SPILLED MATERIA TO EVAPORATE. THEN WASH AREA OF SPILL WITH PLENTY OF WATER. CONTINUE TO THOROUGHLY VENTILATE AREA AND DO NOT ALLOW UNPROTECTED PERSONNEL TO ENTER AREA UNTIL MONOMER CONCENTRATION IS BELOW PERMISSIBLE EXPOSURE LIMIT. VINYL CHLORIDE EVAPORATES COMPLETELY, BUT ADEQUATE VENTILATION MUST BE PROVIDED TO PREVENT EXPLOSIVE MIXTURES. CARE MUST BE TAKEN WHEN USING OR DISPOSING OF CHEMICAL MATERIALS AND/OR THEIR CONTAINERS TO PREVENT ENVIRONMENTAL CONTAMINATION. IT IS YOUR DUTY TO DISPOSE OF THE CHEMICAL MATERIALS AND/OR THEIR CONTAINERS IN ACCORDANCE WITH THE CLEAN AIR ACT, THE CLEAN WATER ACT, THE RESOURCE CONSERVATION AND RECOVERY ACT, AS WELL AS ANY OTHER RELEVANT FEDERAL, STATE, OR LOCAL LAWS/REGULATIONS REGARDING DISPOSAL.

SECTION 8 - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:

NIOSH/MSHA-APPROVED, PRESSURE-DEMAND SUPPLIED AIR, RESPIRATORY PROTECTION WHEN AIR CONCENTRATIONS EXCEED THE PERMISSIBLE EXPOSURE LIMITS. SEE SECTIO 7 FOR RESPIRATORY PROTECTION DURING SPILLS OR LEAKS. THE RESPIRATOR USE LI ITATIONS SPECIFIED BY NIOSH/MSHA OR THE MANUFACTURER MUST BE OBSERVED. RES PIRATORY PROTECTION PROGRAMS MUST MEET THE REQUIREMENTS OF 29 CFR 1910.134.

VENTILATION(TYPE):

USE GENERAL OR LOCAL EXHAUST VENTILATION SUFFICIENT TO LIMIT EMPLOYEE EXPOSURE BELOW PERMISSIBLE EXPOSURE LIMITS.

EYE PROTECTION:

CHEMICAL SAFETY GOGGLES

GLOVES:

NITRILE OR NORTH SILVER SHIELD GLOVES

OTHER PROTECTIVE EQUIPMENT:

BOOTS, APRONS, OR CHEMICAL SUITS SHOULD BE WORN WHEN NECESSARY TO PREVENT SKIN CONTACT. PERSONAL PROTECTIVE CLOTHING AND USE OF EQUIPMENT MUST BE IN ACCORDANCE WITH 29 CFR 1910.132 AND 29 CFR 1910.133.

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SECTION 9 - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN DURING HANDLING AND STORING:

* THIS MATERIAL IS NORMALLY SHIPPED BULK IN TANK CARS. FOR DETAILS ON HANDLING PLEASE REFER TO THE PPG BROCHURE, VINYL CHLORIDE HANDLING AND PROPERTIES (A994-115).
* BEFORE UNLOADING, PURGE OXYGEN FROM UNLOADING SYSTEM.
* CONTAINER AND SYSTEM MUST BE ELECTRICALLY GROUNDED BEFORE UNLOADING.
* STORE AWAY FROM DIRECT SUNLIGHT AND OTHER SOURCES OF HEAT.
* AVOID CONTACT WITH FLAMES, HOT GLOWING SURFACES OR ELECTRIC ARCS.
* DO NOT USE IN POORLY VENTILATED OR CONFINED AREAS.
* STORE ONLY IN CLOSED, PROPERLY LABELED CONTAINERS.

OTHER PRECAUTIONS:

* KEEP OUT OF REACH OF CHILDREN.
* DO NOT BREATHE VAPORS. CANCER-CAUSING AGENT; VAPOR CAN ALSO CAUSE LUNG IRRITATION, DIZZINESS, ANESTHESIA, HELPLESSNESS OR UNCONSCIOUSNESS.
* AVOID CONTACT WITH EYES AND SKIN. CAN CAUSE FROSTBITE AND/OR TISSUE DAMA DUE TO RAPID EVAPORATION.
* DO NOT SWALLOW.
* DO NOT EAT, DRINK, OR SMOKE IN WORK AREAS.
* USE ONLY WITH ADEQUATE VENTILATION SUFFICIENT TO LIMIT EMPLOYEE EXPOSURE BELOW PERMISSIBLE EXPOSURE LIMIT.

COMMENTS:

SPECIAL FIREFIGHTING PROCEDURES (CON'T):

FOR SMALL FIRES, EXTINGUISH WITH CARBON DIOXIDE OR DRY CHEMICAL AGENTS AND WHILE CONTINUING TO COOL EQUIPMENT, ATTEMPT TO CLOSE OFF SOURCE OF LEAK.

THERE IS NO KNOWN EFFECTIVE EXTINGUISHING AGENT FOR LARGE FIRES. THEREFORE, IF SOURCE OF LEAK CANNOT BE CLOSED OFF, CONTINUE COOLING EQUIPMENT WITH STREAMS OF WATER TO AVOID TANK RUPTURE AND EXPLOSION AND ALLOW FIRE TO SELF-EXTINGUISH. NO ONE WITHOUT PROPER RESPIRATORY PROTECTION SHOULD ENTER AN AREA WHERE THERE HAS BEEN A FIRE UNTIL THE AREA HAS BEEN THOROUGHLY VENTILATED AND CHECKED TO BE SURE THE MONOMER CONCENTRATION IS BELOW THE PERMISSIBLE EXPOSURE LIMIT.

TSCA - VINYL CHLORIDE IS ON THE TSCA INVENTORY UNDER CAS NO. 75-01-4.

SARA TITLE III - A) 311/312 CATEGORIES - ACUTE, CHRONIC, FLAMMABILITY, AND SUDDEN PRESSURE RELEASE, B) LISTED IN SECTION 313 UNDER VINYL CHLORIDE, C) NOT LISTED AS AN "EXTREMELY HAZARDOUS SUBSTANCE" IN SECTION 302.

CERCLA - LISTED IN TABLE 302.4 OF 40 CFR PART 302 AS A HAZARDOUS SUBSTANCE WITH A REPORTABLE QUANTITY OF 1 POUND. RELEASES TO AIR, LAND, OR WATER WHICH EXCEED THE RQ MUST BE REPORTED TO THE NATIONAL RESPONSE CENTER, 800-424-8802.

RCRA - WASTE VINYL CHLORIDE AND CONTAMINATED SOILS/MATERIALS FROM SPILL

CLEANUP ARE U043 HAZARDOUS WASTE AS PER 40 CFR 261.33 AND MUST BE DISPOSED OF ACCORDINGLY UNDER RCRA.

CALIFORNIA PROP. 65 - THIS PRODUCT IS A CHEMICAL KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

SL 086679

BFGoodrich
Geon Vinyl Division

MATERIAL SAFETY DATA SHEET
Vinyl Chloride Monomer
Product No.: 06611 B00 0000
Issue: S91
Issued: January 1992
Supersedes: New Issue
Written by: M. Hross

SECTION I

The B.F.Goodrich Company
Geon Vinyl Division
6100 Oak Tree Blvd.
Cleveland, Ohio 44131

Telephone No.: 1-(800) 438-4366
Transportation Emergency No.:
CHEMTREC: 1-(800) 424-9300
Medical Emergency No.:
POISON CENTER: (216) 379-8562

The B. F.Goodrich Company
195 Columbia Street West
Waterloo, Ontario N2J 4N9

Telephone No.: (519) 888-4318
Transportation Emergency No.:
CANUTEC: (613) 996-6666

Chemical Family: Vinyl Halide
Chemical Name/Synonyms: Vinyl Chloride, Chlorethene, Chloroethene, Chloroethylene
Trade Mark: None
Formula: CH_2=CHCl
C.A.S. Registry No.: 75-01-4
TSCA Inventory Status: All ingredients are found on the USEPA's TSCA inventory
Canadian Domestic Substances List Status: All ingredients have been nominated for inclusion
Workplace Hazardous Materials Information System (WHMIS) Classification: A, B1, D1A
Product Use: Manufacture of polyvinyl chloride (PVC) plastics and vinyl chloride copolymers

SECTION II - Hazardous Ingredients

Hazard Summary Statement: CAUTION! Inhalation of the material can cause dizziness, euphoria, nervousness, drowsiness, headache, blurred vision. Extremely high concentrations may cause unconsciousness and death. Vinyl chloride is a confirmed human carcinogen Read entire Material Safety Data Sheet (MSDS). WARNING! Flammable Gas.

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Material	C.A.S. Number	Amount in Product	ACGIH TLV-TWA	OSHA PEL-TWA
Vinyl Chloride Monomer[1,2,3,4,5,6]	75-01-4	>99.9%	5 ppm	1 ppm (5 ppm TWA for any 15 minute period)

Vinyl Chloride Monomer LD_{50} *(rat, inhalation) - 18 pph/15M*
Vinyl Chloride Monomer LC_{50} *- N.E.*

N.A. - Not Applicable **N.E. - Not Established**

Vinyl chloride monomer is shown as an OSHA cancer suspect agent (29 CFR 1910.1017), an American Conference of Governmental Industrial Hygienists (ACGIH) confirmed human carcinogen, and a National Toxicology Program (NTP) and an International Agency for Research on Cancer (IARC) human carcinoger

Legislative Footnotes

[1] Ingredient listed on SARA Section 313 List of Toxic Chemicals

[2] Ingredient listed on the *Pennsylvania Hazardous Substances List*

[3] Ingredient listed on the California listing of *Chemicals Known to the State to Cause Cancer or Reproductive Toxicity*

[4] Ingredient listed on the *Massachusetts Substance List*

[5] *Workplace Hazardous Materials Information System* ingredient found on the Ingredient Disclosure List - Canada

[6] Ingredient listed on the *New Jersey Right to Know Hazardous Substance List*

Notes: *TLV-TWA* – Threshold Limit Value - Time Weighted Average for concentration of the chemical substance in the ambient workplace air. American Conference of Governmental Industrial Hygienists (ACGIH).

OSHA PEL – OSHA Permissible Exposure Limit, 8-hour TWA. 29 CFR1910.1000 1989.

SECTION III - Physical Data

Appearance: Colorless gas
Odor: Mild, sweet odor
Percent Volatiles: 100%
Solubility in Water: 0.11 g/100 g @ 25°C
Physical State: gas (under normal temperatures)

Specific Gravity: 0.97 @ -13°C (9°F) - liquid
Melting Point: -154°C (-245°F)
Molecular Weight: 62.5
Vapor Density: 2.2 (air = 1)

SECTION IV - Fire and Explosion Hazard Data

Flash Point: -78°C (-108°F)

Lower Explosive Limit (LEL): 3.6%

Upper Explosive Limit (UEL): 33%

Self-Ignition Temperature: 472°C (882°F)

Notes: *Flash-Ignition Temperature* -- The lowest initial temperature of air passing around the specimen at which sufficient combustible gas is evolved to be ignited by a small external pilot flame.

Self-Ignition Temperature -- The lowest initial temperature of air passing around the specimen at which, in absence of an ignition source, ignition occurs of itself, as indicated by an explosion, flame or sustained glow.

Extinguishing Media: ABC dry chemical and halons

Special Firefighting Procedures: Firefighters should wear a self-contained breathing apparatus (SCBA) under positive pressure and full protective gear to prevent all body contact.

Stopping the flow of gas rather than extinguishing the fire is usually the best procedure to follow when escaping gas is burning. It may be dangerous to extinguish the flame and allow the gas to continue to flow as an explosive mixture may be formed with air which, if ignited, may cause far greater damage than if the original fire had been permitted to burn. Extinguishing the flame by dry chemical may be desirable where necessary to permit immediate access to shut off the supply.

Unusual Fire and Explosion Hazards: Vapors are heavier than air and may travel along the ground or may be moved by ventilation and ignited by flame, sparks, heaters or other ignition sources at distant locations. Vapors can form flammable mixtures in air.

SECTION V - Reactivity

Stability: Stable (hazardous peroxide can form by oxidation with atmospheric oxygen when stored for prolonged periods in the presence of a variety of contaminants.

Hazardous Polymerization: Will occur. (Polymerizes in the presence of air, sunlight or heat.)

Hazardous Decomposition Products: Hydrogen chloride gas, carbon monoxide, carbon dioxide, and possibly trace amounts of phosgene and other gases.

Incompatibility (Materials to Avoid): Avoid contact with strong oxidizers. Can cause violent polymerization increasing risks of fire and explosion. Metals such as copper, aluminum and certain catalytic impurities can initiate a violent polymerization.

SECTION VI - Health Hazard Data

Threshold Limit Value: 5 ppm Permissible Exposure Limit: 1 ppm

Primary Routes of Exposure: Inhalation, skin and eye contact

Effects of Overexposure: Overexposure to vinyl chloride vapors can produce dizziness, lightheadedness, euphoria, nervousness, drowsiness, headache, blurred vision, impaired hearing and confusion. Extremely high concentrations (>70,000 ppm) may cause unconsciousness and death. Vapor is moderately irritating to the eyes, nose and throat. Liquid vinyl chloride can produce immediate pain and severe irritation and may cause permanent damage to the eyes. Frostbite may cause permanent damage to the skin. Prolonged exposure to high concentrations may cause degeneration of the ends of the finger bones.

Vinyl chloride causes angiosarcoma of the liver, a rare form of liver cancer in humans. Vinyl chloride does not accumulate in the body and is readily eliminated.

Emergency and First Aid Procedures:

Inhalation (of process emissions): Remove affected individual to fresh air while insuring the rescuers utilize appropriate protective equipment. If breathing has ceased, administer artificial respiration. If no pulse is found administer cardio-pulmonary resuscitation immediately. Avoid mouth to mouth contact. Obtain medical attention immediately..

Eye Contact: Immediately flush eyes with lukewarm water for at least 20 minutes while lifting upper and lower eyelids. Seek medical attention immediately.

Skin Contact: Immediately flush contaminated area with lukewarm water for at least 20 minutes. Carefully cut around clothing that sticks to damaged skin and remove rest of garment. Obtain immediate medical attention.

Ingestion: Not an anticipated hazard.

SECTION VII - Spill and Leak Procedure

Steps to be taken in case material is released or spilled: Restrict access to area until completion of clean-up. Insure clean-up is conducted by trained personnel. Wear appropriate personal protection and ventilate area. Extinguish or remove all ignition sources and remove or isolate flammable and combustible materials. Notify governmental authorities as required. Do not

touch spilled material. Prevent material from entering sewers or confined spaces. Stop or reduce leak if safe to do so. Keep materials which can burn away from spilled material. Permit small spills to evaporate. For large spills, dike or flush to ground and allow it to evaporate. Remove contaminated soil and dispose of as hazardous waste.

Waste disposal method: Dispose of waste in accordance with all federal, state and local regulations. If burned, incinerator should be equipped with a hydrogen chloride scrubber. Contaminated soil and containers must be managed as a hazardous waste (U043).

SECTION VIII - Special Protection Information

Ventilation: Effective exhaust ventilation should always be provided to draw fumes or vapors away from workers to prevent routine inhalation. Ventilation should be adequate to maintain the ambient workplace atmosphere below the legislated levels listed in Section II.

Respiratory Protection: Utilize a NIOSH/MSHA-approved respirator under the provisions of 30 CFR Part 11. Read 29 CFR 1910.1017(g)4 for complete details for selection of respirators for vinyl chloride: Unknown atmospheric concentration of vinyl chloride or above 3,600 ppm - open-circuit, self-contained breathing apparatus, pressure demand type with full face piece is required; not over 1,000 ppm - Type C supplied air respirator, continuous flow type, with full or half face piece (helmet or hood) is required.

Protective Equipment: Wear impervious gloves, coveralls, boots and/or other resistent protective clothing. Wear chemical safety goggles and face shield. Have a safety shower/eye-wash station readily available in the immediate work area. An impervious full-body encapsulating suit and respiratory protection may be required in some operations. (Remove contaminated clothing promptly and keep contaminated clothing in a closed container. Discard or launder contaminated clothing before reuse. Inform laundry personnel of contaminants hazards.)

Do not smoke or consume food or beverages in the work area. Wash thoroughly after handling the product.

SECTION IX - Special Precautions

Material Handling: Handle under well-ventilated conditions. Keep product away from sparks, flames and other ignition sources. Sources of ignition, such as static discharge, should be addressed by the user to prevent the ignition and sudden release of energy. Post "NO SMOKING OR OPEN FLAMES" signs in the areas of use or storage. Bond and ground all containers. Label containers according to OSHA standards (29 CFR 1910.1017(l).. All wiring and equipment in storage or use areas must be suitable for Class I, Group D.

Storage: Store in a cool, dry, well-ventilated area, out of direct sunlight and away from incompatible materials. Store away from heat and ignition sources. Store in suitable, labeled containers. Containers should be tightly closed when not in use and when empty protect from damage. Emptied containers may contain residual liquid or vapors which may ignite or explode. Use non-sparking ventilation systems and electrical equipment.

SECTION X - Hazard Codes

NFPA 704 (1980) (National Fire Protection Association)		HMIS (Hazardous Materials Identification System - National Paint and Coatings Association)	
Health:	2	Health:	3
Flammability:	4	Flammability:	4
Reactivity:	1	Reactivity:	2
Special:		Personal Protection:	See MSDS

Section VIII

Key: 0 = Insignificant
1 = Slight
2 = Moderate
3 = High
4 = Extreme

User's Responsibility

This bulletin cannot cover all possible situations which the user may experience during processing. Each aspect of the user's operation should be examined to determine if, or where, additional precautions may be necessary. All health and safety information contained within this bulletin should be provided to the user's employees or customers. We must rely upon the user to utilize this information to develop appropriate work practice guidelines and employee instructional programs for his or her operation.

Disclaimer of Liability

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PRODUCT LABELING INFORMATION

Product: Vinyl Chloride Monomer

The B.F.Goodrich Company
Geon Vinyl Division
6100 Oak Tree Blvd.
Cleveland, Ohio 44131

Telephone No.: 1-(800) 438-4366
Transportation Emergency No.:
CHEMTREC: 1-(800) 424-9300
Medical Emergency No.:
POISON CENTER: (216) 379-8562

The B.F.Goodrich Company
195 Columbia Street West
Waterloo, Ontario N2J 4N9

Telephone No.: (519) 888-4318
Transportation Emergency No.:
CANUTEC: (613) 996-6666

READ MATERIAL SAFETY DATA SHEET (MSDS) BEFORE USE

Vinyl Chloride
Contains Vinyl Chloride
Vinyl Chloride is a Cancer-Suspect Agent

NFPA

HMIS

Health	3
Flammability	4
Reactivity	2
Personal Protection	*

* See MSDS Section VIII

CAUTION! Inhalation of the material can cause dizziness, euphoria, nervousness, drowsiness, headache, blurred vision. Extremely high concentrations may cause unconsiciousness and death. Vinyl chloride is a confirmed human carcinogen of the liver. WARNING! Flammable Gas.

First Aid:

Inhalation of process emissions: Remove affected individual to fresh air. Contact a physician immediately

Eye contact: Flush eyes with water for at least 15 minutes while lifting upper and lower eyelids. Seek medical attention immediately.

Skin contact: Immediately flush area with luke warm water for 20 minumtes.

Contains:

Vinyl Chloride Monomer
(CAS No. 75-01-4) 100%

Ingredients List Required by the New Jersey Right-To-Know:

Vinyl Chloride CAS No. 75-01-4

SL 086686

Shipping Information

IDENTIFICATION - DOMESTIC TRANSPORTATION

Proper Shipping Name (172.10(c)): Vinyl Chloride, Inhibited
(Technical Names(s)) (172.203(k)): N.A.
Hazard Class (172.101(d)): Flammable Gas
UN/NA# (172.101(e)): UN 1086
Haz. Substance (171.8): Vinyl Chloride Reportable Quantity: 1 lb.
Inhalation Hazard (172.2a(b)): N.A.

PACKAGING (Part 173)

- Packaging Sections (172.101(g)) - Col. 5(a): 173.306 Col.5(b): 173.304, 173.314, 173.315
- General Packaging Sections - General 173.24 Hazard Class: Flammable

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DANGEROUS GOODS DETERMINATION (2.1) - INTERNATIONAL TRANSPORT

Proper Shipping Name (Col. B): Vinyl Chloride, Inhibited
Class/Division (Col. C): 2 Subsidiary Risk (Co. D): 3
UN/ID# (Col. A): UN 1086
U.S. Haz. Substance (US 1): Other/Inhalation Haz. (US 34):
Variations (1.8): States (Governments): Carrier (Table 1.8B): N.A.

PACKAGING

- Max. Qty. Per PKg.(Cols. H/J) - Passenger: Forbidden Cargo: 150 Kg.
- Packaging Instructions (Cols. G/I) - Passenger: Forbidden Cargo: 200

MARKING

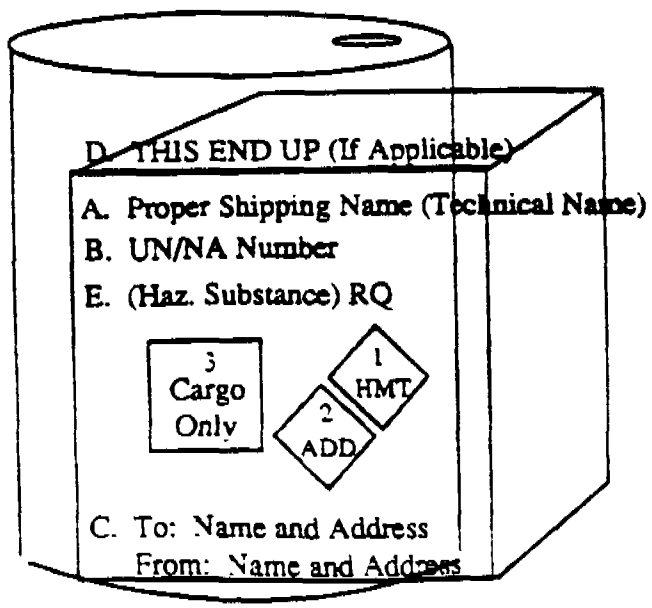
A. Proper Shipping Name (172.301(a))
(Technical Name(s))(172.301(c))
B. UN/NA Number (172.301(a))
C. Name and Address (172.306(a))
D. THIS END UP 9(172.312(a))
E. Haz. Substance RQ (Name)(172.324)
- ORM Designation (172.316(a))
- Inhalation Hazard (172.301(a))

DOMESTIC LABELING

1. HMT LABELS (172.400)
2. Additional Hazard (172.402(a))

INTERNATIONAL LABELING

1. Primary Hazard
2. Subsidiary Risk (If Appropriate)
3. Cargo Aircraft (If Appropriate)



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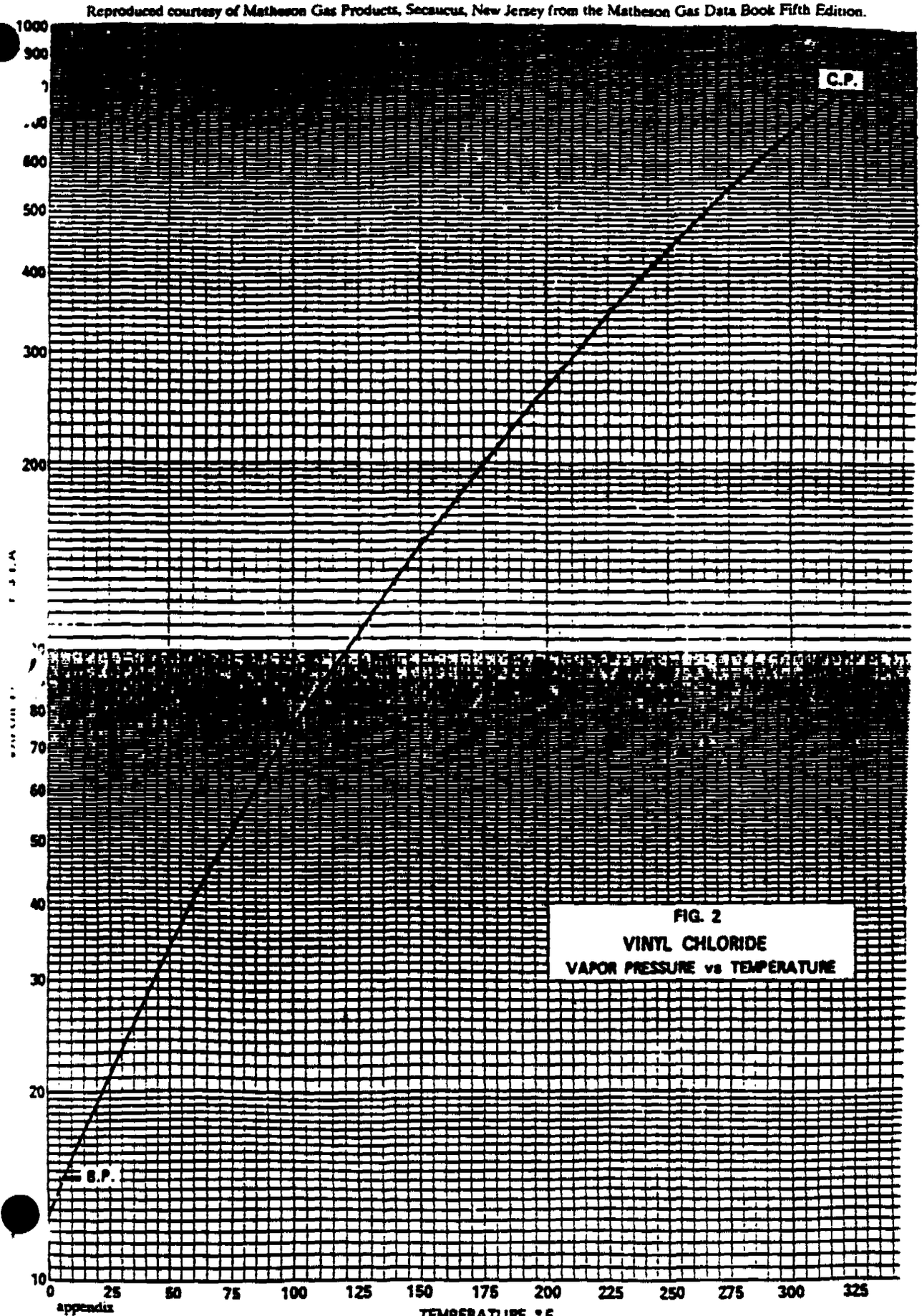

FIG. 2
VINYL CHLORIDE
VAPOR PRESSURE vs TEMPERATURE

Bunker Gear & SCBA is Recommend
for Flammable Response

Silver Shield should be used as
a glove liner only

Levels of Protection

Considered minimum Level for Emergency Response ← B - SCBA - outer & inner gloves

outer & inner gloves ← C - Chem Splash Suits, gloves, Hard Hat, Boots & Air purifying Respirators

D - goggles & gloves