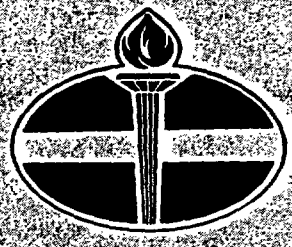
PLAINTIFF'S EXHIBIT

MON-2472

# SAFETY CODE

## SECTION II

# Hazardous Commercial Materials



**AMERICAN OIL COMPANY**

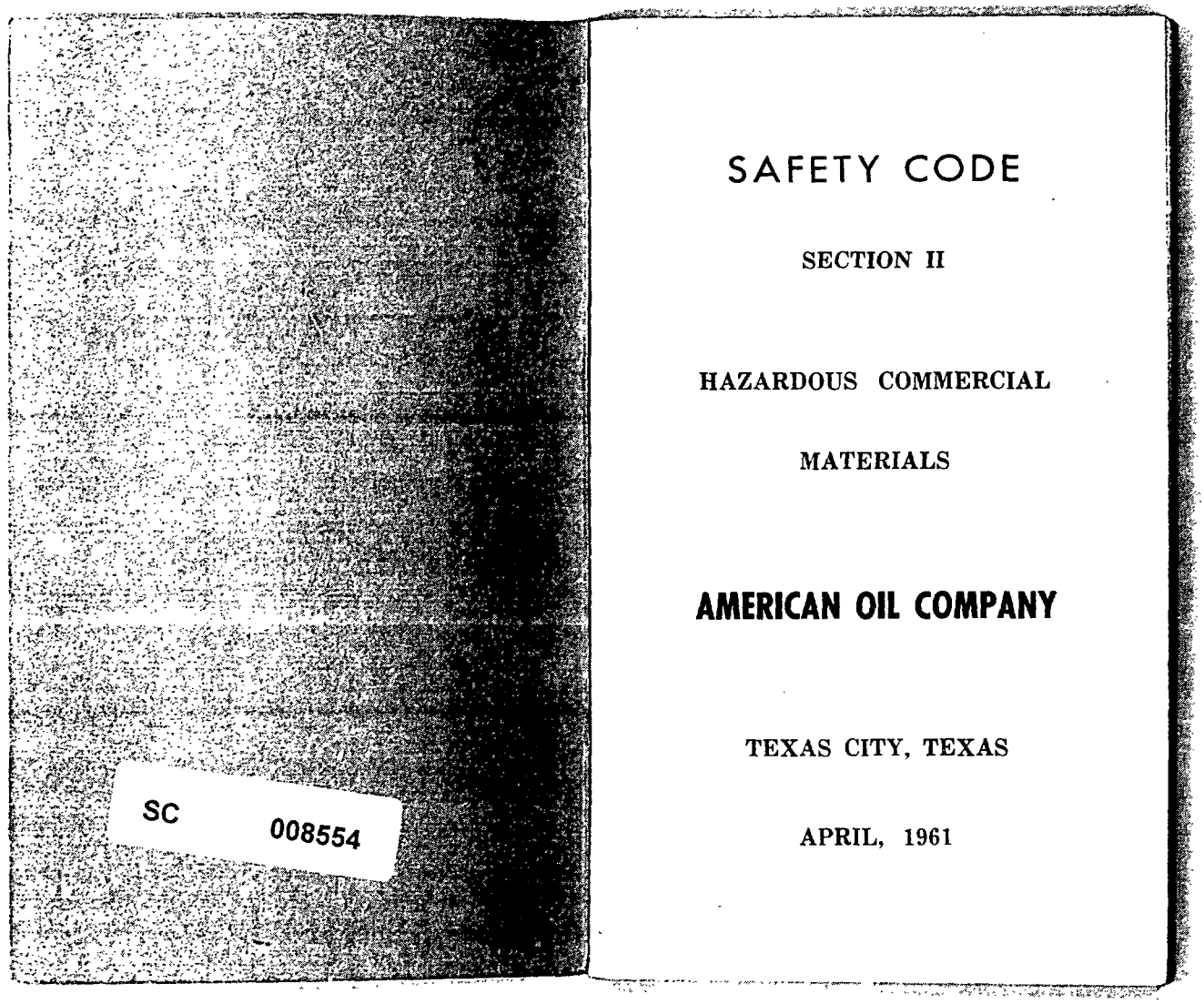
Texas City, Texas

April, 1961

(Supersedes Hazardous Commercial Materials Code Dated December, 1958)

SC 008553

LAM009765


SAFETY CODE
SECTION II
HAZARDOUS COMMERCIAL
MATERIALS
AMERICAN OIL COMPANY
TEXAS CITY, TEXAS
APRIL, 1961
SC 008554

## Preface

This code supersedes all codes previously prepared by the Refinery Safety and Fire Code Committee, pertaining to chemicals.

**(NOTE: This code does not apply to Laboratory operations in their entirety, as the quantities of, and methods for handling these materials by the Laboratory personnel may be such that the provisions of this code are impracticable. Laboratory regulations and procedures take precedent over this code for Laboratory operations. This Hazardous Commercial Materials Code has been prepared primarily for materials being handled in commercial quantities, under commercial conditions.)**

This booklet summarizes the best available information in properties, characteristics, and health hazards, and necessary precautions to be observed regarding certain materials encountered in commercial quantities at this refinery. In addition to hazardous materials, information is given about some non-hazardous materials, in case questions about them should arise. Sources of data are shown.

General precautions are similar to those observed in the handling of common petro-

leum products, all of which are based on good personal cleanliness. Observe all pertinent caution labels, signs, etc. In addition, a number of special precautions are necessary in handling certain materials. These are shown in the following tabulation which furnishes also a ready reference to first-aid measures. It is hereby emphasized that the precautions listed in the table are standard, and employees may be required by their supervisors to observe more extensive protective measures than those indicated.

**QUICK REFERENCE TABLE**

(SEE NUMBERED REFERENCE NOTES FOR FURTHER INFORMATION)

| CHEMICALS | REFERENCE NOTES | PRECAUTIONS: AVOID INHALATION | WEAR RESPIRATOR | WEAR GAS MASK OR AIR PAK | AVOID DIRECT SKIN CONTACT | AVOID EYE SPLASHES | WEAR IMPERVIOUS GLOVES | WEAR SPECIAL CLOTHING | WEAR FACE SHIELD OR GOGGLES | FIRST AID MEASURES: IMMEDIATELY FLUSH FROM EYES WITH WATER | REMOVE CONTAMINATED CLOTHING QUICKLY | QUICKLY WASH FROM SKIN WITH SOAP & WATER | REPORT SKIN CONT ACT TO MEDICAL DEPT. | REPORT CLOTHING CONTACT TO MEDICAL DEPT. | ARTIFICIAL RESPIRATION PROBABLY REQ'D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEROPOAM PHP-1 | 36 | YES | YES | | | | | | | YES | YES | YES | | | |
| AGITENE COLD CLEANER | 1 | YES | | | | | | | | YES | YES | YES | | | |
| ALGAFROG 60 | 2 | YES | | | | | | | | YES | YES | YES | | | |
| ALUMINUM CHLORIDE | 3 | YES | YES | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| AMOCO 523 | 4 | YES | | | | | | | | YES | YES | YES | | | |
| AMOCO 533 | 5 | YES | | | | | | | | YES | YES | YES | | | |
| AMOCO 533 | 6 | YES | | | | | | | | YES | YES | YES | | | |
| AMOCO 533 | 7 | YES | | | | | | | | YES | YES | YES | | | |
| ANTIFOAM A | 8 | YES | | | | | | | | YES | YES | YES | | | |
| ANTIMONY TRICHLORIDE | 9 | YES | YES | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| ANTIOXIDANT 8PC | 10 | YES | | | | | | | | YES | YES | YES | | | |
| BENZENE | 11 | YES | YES | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| BHC DUST (3%) | 8 | YES | | | | | | | | YES | YES | YES | | | |
| BLUE WHITENER-ANTHRA | 10 | YES | | | | | | | | YES | YES | YES | | | |
| CARBON MONOXIDE | 11 | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| CARBON TETRACHLORIDE | 12 | YES | YES | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| CATALYST (See Molybdena Alumina)<br>HYDRO 1 (See Phosphoric Acid)<br>POLY (See Silica-Alumina)<br>OCU (See Silica-Alumina)<br>ULTRA (See Platinum & Cobalt Molybdenum | 33<br>35<br>40<br>38<br>17 | | | | | | | | | | | | | | |
| CAUSTIC SODA | 13 | YES | | | YES | | YES | YES | YES | YES | YES | YES | | | |
| CAUSTIC POTASH | 14 | YES | | | YES | | YES | YES | YES | YES | YES | YES | | | |

* Deviation from this precaution must be approved by Department Head.

## QUICK REFERENCE TABLE

(SEE NUMBERED REFERENCE NOTES FOR FURTHER INFORMATION)

| CHEMICALS | REFERENCE NOTES | PRECAUTIONS | | | | | | | | FIRST AID MEASURES | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AVOID INHALATION | WEAR RESPIRATOR | WEAR GAS MASK OR AIR PAK | AVOID DIRECT SKIN CONTACT | AVOID EYE SPLASHES | WEAR IMPERVIOUS GLOVES | *WEAR SPECIAL CLOTHING | WEAR FACE SHIELD OR GOGGLES | IMMEDIATELY FLUSH FROM EYES WITH WATER | REMOVE CONTAMINATED CLOTHING QUICKLY | QUICKLY WASH FROM SKIN WITH SOAP & WATER | REPORT SKIN CONTACT TO MEDICAL DEPT. | REPORT CLOTHING CONTACT TO MEDICAL DEPT | ARTIFICIAL RESPIRATION PROBABLY REQ'D. |
| CEMENT | 16 | YES | | | | YES | | | | YES | | | | | |
| CHLORINE | 16 | YES | | YES | | | | | | YES | | | | | YES |
| COBALT MOLYBDENUM CAT. | 17 | (SEE REFERENCE NOTES) | | | | | | | | | | | | | |
| COPPER CHLORIDE | 18 | YES | YES | | | | | | | | | | | | |
| CORROSION INHIBITOR | 7 | (SEE REFERENCE NOTES) | | | | | | | | | | | | | |
| CRESYLATE | 13 | | | | YES | YES | YES | | YES | YES | | YES | | | |
| CRONOX 1110 | 7 | | | | | YES | | | | YES | | | | | |
| DIETHANOLAMINE | 19 | YES | | | YES | YES | | | | YES | | YES | | | |
| DOCTOR SOLUTION | 20 | | | | YES | YES | YES | YES | YES | YES | YES | YES | | | |
| DOW CORNING 200 | 21 | | | | | | | | | | | | | | |
| DYES | 22 | | | | YES | YES | YES | | | YES | | YES | | | |
| FOMON A & B (FIRE FOAM) | 23 | YES | YES | | | YES | | | YES | YES | | | | | |
| GLYCERIN | 24 | | | | | | | | | | | | | | |
| GULF AGENT 178 | 7 | YES | | | YES | YES | | | YES | YES | YES | YES | | | |
| HAGATREAT | 25 | | | | YES | YES | | | | YES | YES | YES | | | |
| [redacted] | 26 | | | | YES | YES | YES | | | YES | YES | YES | | | |
| HYDROCHLORIC ACID | 27 | YES | | | YES | YES | YES | | YES | YES | YES | YES | | | |
| HYDROGEN SULFIDE GAS | 28 | YES | | YES | | | | | | | | | | | YES |
| KONTOL 121 | 7 | | | | | YES | | | | YES | | | | | |

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| | | AVOID INHALATION | WEAR RESPIRATOR | WEAR GAS MASK OR AIR PAK | AVOID DIRECT SKIN CONTACT | AVOID EYE SPLASHES | WEAR IMPERVIOUS GLOVES | *WEAR SPECIAL CLOTHING | WEAR FACE SHIELD OR GOGGLES | IMMEDIATELY FLUSH FROM EYES WITH WATER | REMOVE CONTAMINATED CLOTHING QUICKLY | QUICKLY WASH FROM SKIN WITH SOAP & WATER | REPORT SKIN CONTACT TO MEDICAL DEPT. | REPORT CLOTHING CONTACT TO MEDICAL DEPT | ARTIFICIAL RESPIRATION PROBABLY REQ'D. |
| LIME—HYDRATED | 29 | YES | | | YES | YES | | | YES | YES | | YES | | | |
| LITHARGE | 30 | YES | YES | | YES | | | | | | | YES | | | |
| MALEIC ANHYDRIDE | 31 | YES | | | YES | YES | YES | | YES | YES | YES | YES | | | |
| MERCURY | 32 | **YES | | | **YES | | | | | | | | | | |
| METAL DEACTIVATOR | 7 | | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| MOLYBDENA-ALUMINA (Hydro) CAT | 33 | YES | YES | | | | | | YES | | | | | | |
| MONOETHANOLAMINE | 19 | YES | | | YES | YES | | | | YES | | YES | | | |
| MURIATIC ACID | 27 | YES | | | YES | YES | YES | | YES | YES | YES | YES | | | |
| NALCO 37 | 43 | | | | YES | | YES | | | | | YES | | | |
| NALCO 161 & 161 S | 7 | | | | | YES | | | | YES | | | | | |
| NALCO D-1843 | 45 | | | | | | | | | | | | | | |
| PA-1200 | 7 | | | | | YES | | | | YES | | | | | |
| PENECHROME 19 | 7 | | | | YES | YES | | | | YES | | YES | | | |
| PHENOL (Carbolic Acid) | 34 | YES | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| PHOSPHORIC ACID CAT | 35 | YES | YES | | YES | | | | YES | YES | | | | | |
| PLATINUM REFORMER (Ultraf.) CAT | 36 | YES | YES | | | | | | | | | | | | |
| POTASSIUM HYDROXIDE | 14 | YES | | | YES | YES | YES | YES | YES | YES | YES | YES | | | |
| POTASSIUM PERMANGANATE | 37 | | | | | | | | | | | | | | |
| RP-2 | 7 | | | | YES | YES | | | | YES | YES | YES | | | |
| SA-550 | 38 | YES | | | YES | YES | YES | | YES | YES | YES | YES | YES | YES | |

* Deviation from this precaution must be approved by Department Head.
** Avoid unnecessary inhalation and skin contact.

## QUICK REFERENCE TABLE

(SEE NUMBERED REFERENCE NOTES FOR FURTHER INFORMATION)

| CHEMICALS | REFERENCE NOTES | PRECAUTIONS: AVOID INHALATION | WEAR RESPIRATOR | WEAR GAS MASK OR AIR PAK | AVOID DIRECT SKIN CONTACT | AVOID EYE SPLASHES | WEAR IMPERVIOUS GLOVES | WEAR SPECIAL CLOTHING | WEAR FACE SHIELD OR GOGGLES | FIRST AID MEASURES: IMMEDIATELY FLUSH FROM EYES WITH WATER | REMOVE CONTAMINATED CLOTHING QUICKLY | QUICKLY WASH FROM SKIN WITH SOAP & WATER | REPORT SKIN CONTACT TO MEDICAL DEPT. | REPORT CLOTHING CONTACT TO MEDICAL DEPT. | ARTIFICIAL RESPIRATION PROBABLY REQ'D. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SC COLD CLEANER #49 | 39 | YES | | | YES | YES | YES | | | YES | | YES | | | |
| SILICA - ALUMINA (CCU) CAT. | 40 | | | | | | | | | | | | | | |
| SILICA GEL | 41 | | | | | | | | | | | | | | |
| SODA ASH | 42 | YES | YES | | | YES | | | YES | | | | | | |
| SODIUM DI- or BI-CHROMATE | 43 | | | | YES | YES | | | YES | YES | YES | YES | | | |
| SODIUM METASILICATE | 44 | YES | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| SODIUM PHOSPHATE | 45 | | | | | | | | | | | | | | |
| SODIUM SULPHITE (SANTOSITE) | 46 | | | | | | | | | | | | | | |
| SOVA BEAD | 41 | | | | | | | | | | | | | | |
| SULPHUR | 47 | | | | | | | | | | | | | | |
| SULPHURIC ACID | 48 | YES | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| TBC (Tertiary butylcatechol) | 49 | | | | YES | YES | YES | | YES | YES | | YES | | | |
| TEFLON | 50 | (SEE REFERENCE NOTES) | | | | | | | | | | | | | |
| TETRAETHYL LEAD | 51 | YES | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| TOLUENE | 52 | YES | | | YES | YES | | | | | | | | | |
| TRETOLITE L3244 | 53 | | | | | | | | | | | | | | |
| TRIETHANOLAMINE | 7 | YES | | | YES | YES | | | | YES | | YES | | | |
| UNOX PENETRANT | 54 | (SEE REFERENCE NOTES) | | | | | | | | | | | | | |
| XYLENE | 55 | YES | | | YES | YES | | | | YES | YES | YES | | | |
| ZEOLITE | 56 | | | | | | | | | | | | | | |

* Provisions set up herein are supplementary to regulations imposed by manufacturers of tetraethyl lead, and in no way shall be construed as taking precedent over manufacturers' regulations.

## AVOID INHALATION

(See Quick Reference Table)

Ordinary Filter—

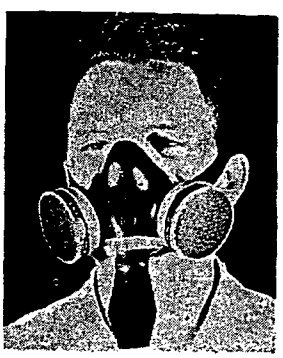
Nuisance Dusts

Special Filter—

Lead Dust (Litharge)

## RESPIRATORS

Chemical Filters for Paint—Mild Acid or Organic Vapors





SC 008558

LAM009770

## WEAR GAS MASK

(See Quick Reference Table)

HOSE MASK AND BLOWER
For Long Periods of Protection

## WEAR AIRPAK

(See Quick Reference Table)

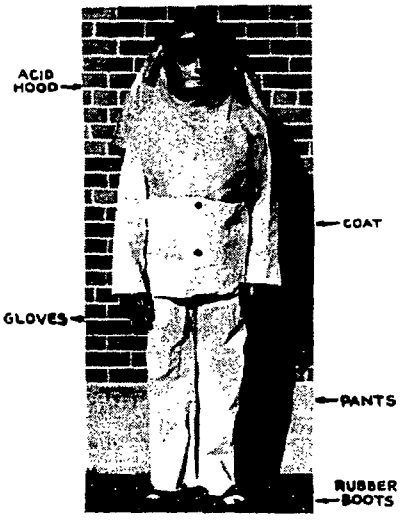
SCOTT
AIRPAK

All-Purpose
Respiratory
Protection



## WEAR IMPERVIOUS CLOTHING

(See Quick Reference Table)



## WEAR GAS MASK

(See Quick Reference Table)

CANISTER TYPE MASK

Organic

Vapors

(tetra ethyl lead)

Smoke

## AVOID EYE SPLASHES

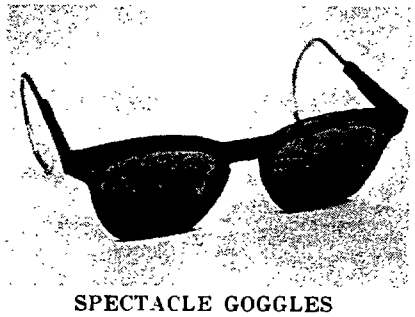
FACE SHIELD



## AVOID EYE SPLASHES

(See Quick Reference Table)

Face Shield Attached To Hat



SPECTACLE GOGGLES

## AVOID EYE SPLASHES

(See Quick Reference Table)

CHEMICAL GOGGLES



## HAZARDOUS COMMERCIAL MATERIALS—Reference Notes

### 1. AGITENE COLD CLEANER

Agitene is a safe, mild solvent for removing oil, grease, and gummy deposits from metal parts. It is a liquid with a clear green color. It contains soothing emollients to protect the skin from irritation. The material may cause irritation to the eyes so eye splashes are to be avoided. This material has a flash point of 105°F and is not to be used as a general cleaning solvent. It is to be used in a special pump equipped cleaning cabinet in the machine shop.

### 2. ALGATROL SQ

(Ref: Information from Aquatrol, Inc., Houston, Texas)

Algatrol SQ is a heavy straw-colored non-volatile liquid received in 55-gallon drums. It is used as a treatment against algae in cooling tower water. It is non-toxic to men, animals, and fish in the recommended concentration of 66 ppm in water.

In its pure form there is little or no hazard from skin contact if the material is

washed off within a reasonable period of time. The material has an irritating effect on the eyes similar to a strong detergent; therefore, eye splashes should be avoided. In case of eye splashes, wash the eyes thoroughly with water and then report to the Medical Department.

## 3. ALUMINUM CHLORIDE AND ANTIMONY TRICHLORIDE

(Ref: Manufacturing Chemists Association Safety Data Sheets; "Chloride Metallurgy," by Stauffer Chemical Company; operating instructions from Shell Oil Company, and information from American Oil Company refineries at Wood River, El Dorado, and Yorktown.)

These two chemicals are listed together for discussion in this section since both are used only in the butane isomerization section of alkylation unit No. 2. These are catalyst materials introduced into the same vessels in this unit and the hazardous properties insofar as handling are identical.

In the presence of water, both aluminum chloride and antimony trichloride give off hydrogen chloride which is a highly irritating gas. These chemicals are capable of reacting with moisture in the atmosphere



to emit this toxic gas in a mist form. Both chemicals react violently if water is poured on them. In addition, antimony salts are toxic.

Hydrogen chloride vapors are corrosive to the skin and mucous membranes. Skin and eye contact should be avoided and the vapors should not be inhaled. When the dry aluminum chloride is handled, dusting may occur. Contact with the moist skin will cause irritation. Irritation is especially severe if the dust gets in the eyes or is inhaled. In case of skin or eye contact, the affected parts should be washed with plenty of water.

Aluminum chloride is received in 550-lb steel drums as 0-4 mesh lump material. Antimony trichloride is normally received as a solidified mass in 700-lb drums and therefore presents no dusting problem. These drums must be stored in a dry, well ventilated area and the containers must be kept closed tightly except when material is being removed. Bulging of a drum indicates moisture seepage and pressure should be relieved by removing the vent bung to allow release of the hydrogen chloride. Care should be taken to avoid contact or inhalation of these vapors.

In case of spills, as much of the dry material as possible should be picked up.

The remainder should be washed down with large quantities of water and the run-off should be treated as hydrochloric acid.

Employees adding these chemicals to the catalyst make-up vessels should wear dust respirators, closed type eye protection, and rubber or plastic-coated gloves.

A sludge material sometimes called "Red Oil" is drained from the catalyst scrubber for disposal in the sludge disposal column. The wooden sludge tower is open to the atmosphere and during hydrolyzing of the sludge somewhat violent chemical reaction occurs. Employees working with this equipment should wear eye protection and impervious gloves. In case of sludge contact with the skin, first wipe off with a dry rag and then flush residue with water.

The piping system between the catalyst make-up drums and the reactors carries a high concentration of catalyst in butane. In the event of leaks; opening of these lines without purging; or if for any reason this material is vented to atmosphere, employees should approach with caution since moisture in the atmosphere or some other water source may generate hydrogen chloride. Also, since hydrogen chloride gas is introduced to the system at a point down stream from the catalyst recovery column, free hydrogen chloride may be released at other openings.



## 4. AMMONIA—ANHYDROUS AND AQUA

(Ref. API Toxicological Review, Ammonia, September 1948; MCA Chemical Safety Data Sheet SD-13, Aqua Ammonia, Adopted 1947)

In case of burns, or serious exposure of the eyes, wash promptly with plenty of water and report to the Medical Department.

Anhydrous Ammonia ($NH_3$) is a colorless gas at ordinary temperatures and pressures, a colorless liquid as shipped in pressure containers. It is characterized by a very pungent odor. Ammonia is readily soluble in water forming aqua ammonia ($NH_4OH$), a colorless liquid with the same pungent odor as anhydrous ammonia. Liquid anhydrous or aqua ammonia will cause severe burns on contact with the skin or mucous membranes. Ammonia gas exerts a caustic irritating action on the respiratory tract. Eyes are particularly sensitive to either liquid or gaseous ammonia.

Anhydrous ammonia is used in the pipe still No. 3 overhead system for corrosion control.

Aqua ammonia is used in the overhead systems of pipe stills 1 and 2 and in the Ozalid reproduction machines.

## 5. AMOCO 533

(Ref: Technical Bulletin C-3-115, Koppers Company)

Amoco 533 is used at the toluene unit as a gum inhibitor during the production of nonene. The material is received in cylindrical cardboard boxes and has the appearance and texture of sugar. It is introduced into the process stream by pouring manually into a small charge drum. There are no hazards involved in its handling.

## 6. ANTIFOAM "A" (Dow Corning)

(Ref.: Rochow-Chemistry of the Silicones, 1946.)

Antifoam "A" is a silicone derivative. It is a thick, white, jelly-like substance resembling cooked starch.

Available information indicates that no particular health hazards are involved in its handling.

Antifoam "A" is used to decrease foaming.



## 7. ANTIOXIDANTS, CORROSION INHIBITORS AND METAL DEACTIVATORS

The materials currently used covered in this section under the title classifications are as follows:

Amoco 532 - antioxidant
Amoco 523 - copper deactivator.
Gulf Agent #178
Triethanolamine
Cronox 1110
Kontol 121
Nalco 161
Nalco 161S
PA 1260
RP - 2
Penechrome 19

(Note: These may be substituted for at times and information concerning the substitution will be published.)

For the purpose of providing a guide for adequate protection against exposure these chemicals shall be divided into two groups, since some are more hazardous than others. All may be identified by the labels on the drums in which they are supplied.

The hazardous chemicals are Amoco 532, Amoco 523 and Gulf Agent #178. These products are supplied in liquid form and are injected into various petroleum prod-

ucts to improve the stability of these products during storage.

A. FIRST AID

If any of these products comes in contact with the skin, the area involved shall be scrubbed thoroughly with soap and water. When non-protective clothing is contaminated, the clothing shall be removed from the area involved and the skin scrubbed thoroughly with soap and water. In the event any of these materials is splashed in the eyes, clean water shall be used immediately to flush out the eyes. Open the eyes, forcibly if necessary, wash the skin around the eyes thoroughly with soap and water. After these emergency measures, report promptly to the Medical Department.

B. PRECAUTIONARY MEASURES

Inhibitors, antioxidants, and metal deactivators should be handled cautiously to prevent skin contact. The following are precautionary practices which should be followed:

(1) Avoid the use of open containers.

(2) Wear suitable protective clothing such as face shields, rubber gloves, rubber aprons, etc., when performing work where it is possible to come in contact with these chemicals.

(3) Mark each drum or container with conspicuous caution labels upon receipt at the plant.



(4) Drums or containers should remain sealed until their contents are required for use.

(5) As soon as a drum or container has been emptied replace plugs. Empty drums shall be steamed at the salvage yard, and those not returnable shall be crushed and discarded with bungs removed.

(6) Clothing or shoes contaminated with these chemicals shall be removed and must not be worn again until thoroughly cleaned with soap and water.

(7) Suitable caution signs shall be displayed conspicuously around the injection systems handling these materials. Such signs shall read "Caution —Skin Irritant".

Triethanolamine, Cronox 1110, Kontol 121, Nalco 161, PA 1260, Penechome 19 and RP-2 are liquids which are injected into various petroleum systems (water streams in the case of Penechrome 19) to serve as internal corrosion protection for pipes and vessels handling the product. These materials are relatively nonhazardous compared with those covered previously in this section.

Prolonged or frequently repeated contact of Triethanolamine, RP-2 or Penechrome 19, with the skin may cause irritation. In case of RP-2 or Penechrome 19 contact with the skin, the affected area should be washed thoroughly with soap and water. None of

the other materials are considered hazardous insofar as skin contact. Caution should be observed with all of these materials to avoid eye splashes.

Ref.: Various booklets, bulletins and data sheets from Universal Oil Products, Dupont, Tennessee Eastman Company, Texas Company, National Aluminate Corp., Monsanto, and Union Carbide Chemicals Company.

## 8. BENZENE

(Ref.: A.P.I. Toxicological Review, Benzene, September, 1948)

### A. FIRST AID

A person who is unconscious or not breathing in an atmosphere suspected to be contaminated by benzene should be removed to fresh air as quickly as possible, care being taken that rescuers are not also overcome. The victim should be kept warm and at complete rest. Summon medical assistance at once, but keep the person breathing, by artificial respiration if necessary.

### B. PRECAUTIONARY MEASURES

During sampling and gauging operations workers shall stand at hatches so that the wind is from their side (rather than front or back). This is to avoid eddy currents during sampling and gauging operations. When excessive concentrations are unavoidably encountered, or when entering atmosphere of potential contamination (tank cleaning work, etc.), portable breathing



apparatus with eye protection incorporated into the mask equipment shall be worn.

### AVOID CONTACT WITH BENZENE LIQUID

All necessary precautions shall be taken to avoid contact with benzene liquid, as it dissolves the natural oils out of the skin and leaves it rough and dry. Continued exposure may result in cracking of the skin. Whenever the possibility of contact with benzene liquid is anticipated, goggles and protective clothing (rubber gloves, boots, rubber coats, rubber trousers, etc.) shall be worn. Rubber gloves and goggles shall be worn during sampling, gauging and tank car loading operations, and when working on lines and equipment. In case of skin contact, the affected parts shall be washed with soap and water as soon as practicable.

### C. DESCRIPTION OF BENZENE

The chemical formula for benzene is $C_6H_6$. Its molecular weight is 78.11, boiling point is 176.2°F., and specific gravity is 0.8787 at 59° F. with respect to water. Its API gravity is 28.9°. The specific gravity of benzene vapor with respect to air is 2.692 (heavier than air).

Pure benzene is a clear, colorless liquid. Its vapor has a characteristic pleasant odor at low concentrations and disagreeable odor at higher concentrations. Benzene burns with a yellow, luminous, smoky flame.

Benzene vapor is combustible in concentrations of 1.4 to 6.8 percent in air.

D. BENZENE CONCENTRATIONS

At the 1959 meeting of the American Conference of Governmental Industrial Hygienists the concentration of benzene in air was established as 25 parts per million (25 ppm) as the maximum permissible benzene concentration for workers exposed to this substance during an 8-hour day.

Momentary concentrations considerably in excess of 25 ppm are not considered dangerous. However, one must remember that the greater the concentration, the less should be the time of the exposure.

The effects of exposure to higher concentrations of benzene may be summarized as follows:

| Concentration | Comments |
|---|---|
| 1500 to 3000 ppm for one hour— | Bearable, mild dizziness, drowsiness, weakness, headache, breathlessness, etc. |
| 3000 to 4700 ppm for one hour— | Dangerous, serious dizziness, drowsiness, weakness, headache, breathlessness, apprehension of death, etc. |
| 7500 ppm for ½ - 1 hour— | Very dangerous. |
| 20,000 ppm for 5 - 10 minutes— | Fatal. |

Repeated exposures to concentrations in excess of 100 ppm can produce harmful effects as the human body develops no tolerance to benzene.



Concentrations of 1500-3000 parts per million might be encountered within one foot of open manholes or gauge hatches while benzene is being pumped into a vessel.

## 9. BHC DUST (3%)

3% BHC Dust is an abbreviation for 3% benzene hexachloride, a white powdery material. Benzene hexachloride is the active ingredient in the material used in this plant to control mosquitoes. This is the same material which has been used by the Galveston County Mosquito Control Board for the past two years.

The gamma isomer of benzene hexachloride is less hazardous to humans than DDT. The manufacturer advises that the dust or vapor from this mixture may cause irritation of the skin or eyes or may be absorbed through the skin. Avoid breathing excess quantities of the dust or vapor, or contact with the skin or eyes. In case of skin contact, wash with soap and water. For eyes, flush with plenty of water and get prompt medical attention.

Persons exposed to high concentrations such as employees required to handle the sacks for storing and those who fill the dusting equipment should wear goggles, dust respirators and rubber gloves.

Ref: 1. Manufacturers label - Mathieson Chemical Corporation

2. "Handbook of Dangerous Materials" by Sax

## 10. BLUE WHITENER—ANTHRA

Blue whitener is a dye. It is a fine powder, very dark blue in color—almost black.

This dye is a possible skin sensitizer, and may even be an irritant to certain persons having sensitive skin. Skin contact or inhalation should be avoided.

Blue whitener is used at the main and ethyl pump houses for masking color in gasoline and kerosene.

## 11. CARBON MONOXIDE

(Ref: Occupational Hazards, September and November, 1948)

A person overcome by carbon monoxide poisoning should be removed to fresh air immediately and kept warm and quiet until medical assistance can be procured. If the victim has stopped breathing, artificial respiration should be given promptly.

Carbon monoxide is a very poisonous gas. It is colorless, tasteless, and almost odorless, giving no warning of its presence. Its specific gravity relative to air is 0.967 (only slightly lighter than air). Symptoms of carbon monoxide poisoning may be



tightness across the forehead, weakness, and dizziness. The victim's face may become flushed, the eyeballs a bright red, and the heart may be beating heavily. Nausea and vomiting may occur. However, it is possible for a person to become unconscious without any of these symptoms or signs.

A common source of this gas is from the exhaust of automobiles and other internal combustion engines.

The most likely locations for possible exposure to carbon monoxide at the refinery are as follows:

(1) In catalytic cracking unit No. 1, 2 and 3 reactors.

(2) In catalytic cracking units Nos. 1, 2 and 3 regenerators, including the flue gas system.

(3) In catalytic cracking unit No. 3, CO Boilers duct work, seal pots and stacks.

(4) In the hydro reactors and flue gas system.

(5) In the Carbide meter house.

(6) At Ultraformer No. 1:
- (a) 6 reactors
- (b) B-3 furnace
- (c) L-4 inert gas generator
- (d) F-1 high pressure separator

(7) At Ultraformer No. 2:
   (a) 7 reactors
   (b) L-1A and L-1B inert gas generators
   (c) F-6 high pressure separator

Tests for carbon monoxide shall be made prior to entry into vessels or large diameter pipes of systems listed above. The safe allowable limit for an 8-hour period is 100 ppm (.01%).

## 12. CARBON TETRACHLORIDE

(Ref.: A.P.I. Toxicological Review, Carbon Tetrachloride, September, 1948)

A person overcome by carbon tetrachloride should be removed immediately from the contaminated atmosphere and kept warm and quiet. Artificial respiration should be administered if normal respiration ceases. Secure medical assistance at once.

Carbon tetrachloride is a clear colorless liquid with a pleasant aromatic odor. It is closely related to chloroform. It is nonflammable. It is toxic by inhalation and by prolonged or repeated contact with the skin or mucous membranes. Since the main portal of entry into the system is through the lungs, it should not be used in an inadequately ventilated location.

CARBON TETRACHLORIDE IS VERY



DANGEROUS. It is not safe to inhale more than a few breaths of the material.

The maximum allowable concentration of carbon tetrachloride for persons exposed during an 8-hour day has been set at 25 parts per million by the American Conference of Governmental Industrial Hygienists.

The effects of various concentrations may be summarized as follows:

| EFFECT | PARTS PER MILLION |
|---|---|
| Least detectable odor | 70 |
| Nausea, vomiting, and headache after 30 minutes exposure | 320 |
| Very strong odor | 475-800 |
| Dangerous to life in 30 minutes | 5,000 |
| Deadly in 5 to 10 minutes | 50,000 |

Carbon tetrachloride is used in this plant primarily as a cleaning solvent. IT SHOULD ONLY BE USED WHERE VENTILATION IS ADEQUATE. IT IS A VERY DANGEROUS MATERIAL.

## 13. CAUSTIC SODA

(Ref.: M.C.A. Chemical Safety Data Sheet SD-9, Caustic Soda, adopted 1947)

In case of burns from caustic soda, wash promptly with plenty of water and report to the Medical Department.

Caustic soda (sodium hydroxide, com-

monly called lye) is a very strong alkali which may be in liquid, powder, solid, or flake form. Liquid and flakes are used by this company. The liquid ordinarily is clear, water white, but is sometimes gray. Flake caustic is milky white or light gray, and as the name implies is in the form of flaky crystals. When making solutions of dry caustic soda, add the caustic slowly to the surface of the solution to avoid violent spattering.

Whether in liquid or dry form, marked corrosive action results from contact with all tissues of the body. It is especially dangerous to the eyes.

Liquid caustic soda is used at the alkylation units, toluene unit, catalytic cracking units No. 1, 2 and 3, and pipe still No. 3. Flake caustic soda is used at the water treating plants.

During treating operations, the caustic soda reacts with cresylic acids (acid oils) in raw gasoline and gas oils to form cresylates. These cresylate solutions are hazardous because of the caustic soda and the cresylates. Cresylates are chemically similar to phenol (see Section No. 34 on phenol).

## 14. CAUSTIC POTASH

(Ref.: M.C.A. Chemical Safety Data



Sheet SD-10, Caustic Potash, Adopted 1947)

In case of burns from caustic potash, wash promptly with plenty of water and report to the Medical Department.

Caustic potash may be used interchangeably with caustic soda (lye) in treating water and petroleum stocks.

Caustic potash (potassium hydroxide) is a very strong alkali which may be in liquid, powder, solid, or flake form. The liquid ordinarily is clear, water white, but occasionally is light yellow. Flake caustic potash is white or light gray, and is in the form of flaky crystals. When making solutions of dry caustic potash, add the caustic slowly to the surface of the solution to avoid violent spattering.

Whether in liquid or dry form, marked corrosive action results from contact with all tissues of the body. It is especially dangerous to the eyes.

## 15. CEMENT

(Ref.: Occupational Hazards, June, 1947)

The main constituents of cement are lime, silica, and alumina, ground to a fine powder. Ordinary cement is gray in color; however, some cements are made white by addition of special ingredients or by special manufacturing methods.

Cement dust reacts with water to pro-

duce a mild caustic. Therefore, eye splashes are to be avoided.

## 16. CHLORINE

(Ref.: U. S. Dep't. of Labor Pamphlet on Controlling Chemical Hazards, Series No. 2, Chlorine)

A person overcome by chlorine gas should be removed to uncontaminated air immediately, kept warm and quiet, placed on his back with head and back elevated, and urged to resist coughing. Secure medical assistance immediately. If breathing has ceased, start artificial respiration at once.

At atmospheric conditions chlorine is a heavier-than-air gas with a sharp pungent odor and a greenish yellow color. It is a powerful respiratory irritant. Chlorine is classed as a poisonous gas, deriving its poisonous effects from irritating action on the respiratory tract. Inhalation has a stifling effect, causing coughing, nausea, and vomiting. Response to various concentrations of chlorine gas in air is as follows:

| | |
|---|---|
| Least detectable odor | 3.5 ppm |
| Least amount causing throat irritation | 15.0 ppm |
| Least amount causing coughing | 30.0 ppm |
| Maximum for even short exposure | 40-60.0 ppm |
| Rapidly fatal | 1000.0 ppm |



In concentrations far below injurious ones, chlorine gives warning of its presence by its odor.

Chlorine is used in water treating to control the growth of algae in the cooling water systems.

## 17. COBALT MOLYBDENUM CATALYST

Cobalt-molybdenum catalyst is in the form of 3/16" x 3/16" cylindrical pellets and is a bluish gray color. The catalyst contains less than 5% cobalt compound, less than 10% molybdenum compound, and the bulk of the material consists of an alumina compound. Since the materials in the catalyst, with the exception of cobalt, are considered non-toxic, this code will deal with the hazards of the cobalt only.

This catalyst is used in the hydrodesulfurizing process at Ultraformer No. 2 and will be found in D-7 reactor. This vessel has two large openings, one off center at the top and one off center at the bottom. These are for the purpose of loading and unloading the catalyst. Since loading and unloading will be to some extent done manually, there is exposure to the fines or dust from this catalyst. Excessive inhalation of cobalt dust may cause lung damage; therefore, precautions must be taken. Furthermore, cobalt carbonyl can be formed in the regeneration process. Cobalt carbonyl is a poisonous gas. Strict precautions

must be taken against inhalation. The following precautionary measures are prescribed:

1. Following regeneration and air purge of the D-7 reactor, tests will be made to determine the concentration of cobalt carbonyl and carbon monoxide. When the concentration of cobalt carbonyl is 1 ppm. or less, and that of carbon monoxide is below the allowable limit, the reactor may be opened.

2. Fresh air masks must be worn by employees removing the manway covers from the top and bottom of the reactor and while remaining in the immediate vicinity of the manway openings until mechanical ventilation is established.

3. Fresh air masks must be worn during entry of the reactor if catalyst is present.

4. Dust respirators must be worn outside the tower by employees loading, dumping or screening catalyst and by employees in the area, other than those actually handling the catalyst, who are exposed to breathing heavy concentrations of the catalyst dust.

5. In addition to 4, above, a pneumatic dust collection system must be in operation at the lower manway of D-7 reactor during unloading operations and at the screening device during sifting operations.



6. Excessive accumulations of catalyst dust on ground areas should be washed to the sewer.

7. Excessive catalyst dust shall be removed from workmen's clothing by the use of a vacuum cleaner at the end of the work period.

Ref.: 1. El Dorado No. 2 Ultraformer-Hydrosulfurizer Operating Instructions Manual by the Lummus Company

2. Hydrodesulfurization Process Manual dated Feb. 1957 from Research Department, Whiting Laboratories, Standard Oil Co. (Ind.)

3. Letter dated July 19, 1957 from A. S. Eichorn to C. A. Mattiza (both of Harshaw Chemical Company), subject: American Oil Company, Texas City, Texas

4. Notes taken by Mr. G. M. Dent at the Company-wide Safety Meeting in Chicago, October 24, 1957

5. Safety Serial No. 97, "Handling Ultraformer Catalyst", dated Nov. 12, 1957 from the Standard Oil Company (Ind.) Sugar Creek, Missouri refinery

6. Handbook of Dangerous Materials by Irving Sax (dated 1951)

## 18. COPPER CHLORIDE

(Ref: Information from American Oil Company refinery at Yorktown)

Copper chloride (or cuprous chloride) is used in the product treating section of pipe still No. 3. It is mixed, by hand, with Fullers Earth prior to dumping into an enclosed product mixing tank. This mixture is then inducted into the system.

Copper chloride is a blue-green material, in granular form, without noticeable odor. There is no report from other users of cases of skin irritation. The material is poisonous if taken internally.

During mixing operations, respirators used for nuisance dusts must be worn.

## 19. DIETHANOLAMINE AND MONOETHANOLAMINE

(Ref.: Carbide and Carbon Chemicals Booklet, "The Use of the Ethanolamines for Gas Treatment")

Pure diethanolamine is a crystalline white solid which melts at 82°F. As received in 55-gallon drums, diethanolamine is a viscous water white liquid resembling white Karo syrup. It has a very mild ammoniacal odor.

Monoethanolamine is similar to Diethanolamine in appearance and odor.



Prolonged or frequent repeated contact of these materials with the skin may cause irritation. Care should be taken to prevent contact with the eyes.

Diethanolamine is used in the hydrogen sulfide removal facilities at catalytic cracking units No. 2 and 3.

Monoethanolamine is used in the carbon dioxide removal facilities at Ultraformer No. 1.

## 20. DOCTOR SOLUTION

Doctor solution is a mixture of litharge and liquid caustic soda. Precautions and first aid measures to be observed in the handling of doctor solution are the same as prescribed elsewhere in this code for litharge and caustic soda.

## 21. DOW CORNING - 200

Dow Corning-200 is a clear, thick syrupy material received in five-gallon buckets.

There are no health hazards involved in its handling.

Dow Corning-200 is used in the coking unit to decrease foam level in the coke drums.

## 22. DYES—Orange, Red, Blue and Yellow

(Ref.: Letter—Haskell Laboratory of Industrial Toxicology to Dr. S. L. Rankin of Du Pont)

Oil soluble dyes used for coloring gasoline are finely divided powders having an oily appearance. Orange dye resembles orange brick dust, particularly after having absorbed moisture from the air. Red and blue dyes are very dark in color in the powder form, resembling soot. The yellow dye is a normal yellow color.

Yellow, orange, and blue gasoline dyes have been shown to produce sensitization in guinea pig skin, and it is probable, therefore, that they could cause skin sensitization in some human beings.

Yellow gasoline dye is a mild irritant on skin contact. Red dye is a stronger contact irritant.

These dyes are utilized at the ethylizing pump house in coloring leaded gasoline.

## 23. FOMON (FIRE FOAM)

Fomon A and Fomon B are powdery substances which form a thick sudsy foam when mixed together with water. The materials are used as a fire extinguishing agent and are stored in 50# cans in the fire station.



[redacted]

E. DRAWINGS

[redacted]

## 27. HYDROCHLORIC (MURIATIC) ACID

Hydrochloric (muriatic) acid is a clear, water white liquid which gives off a colorless gas with a biting odor. It is readily soluble in water, and usually is encountered commercially in water solutions of various concentrations.

A person overcome by hydrochloric acid fumes should be removed to fresh air immediately, care being taken that rescuers are not also overcome. If breathing has ceased, start artificial respiration at once. Secure medical assistance.

For burns to the skin or eyes, flush quickly with large quantities of water and summon medical assistance.

Commercial hydrochloric acid (27.92% concentration) is used in the plant for cleaning pump cases, compressor water jackets, new brickwork, etc. A solution of

about 12 percent hydrochloric acid is used in solvent cleaning of exchangers.

Carboys in which we receive hydrochloric acid from the manufacturer carry the following warning label:

"Contents Dangerous.

"Before Moving Carboy Be Sure Stopper is Securely Fastened. Keep Out of Sun and Extreme Heat. Never Use Pressure to Empty.

"Avoid Contact with Skin—Do Not Breath Fumes. Absorb Spillage With Dry Sand, Ashes, Or Earth.

"Completely Drain Carboy Before Return. If Injured By Contents, Use Water Freely At Once And Obtain Medical Treatment Immediately."

Hydrogen chloride gas (hydrochloric acid gas) is introduced in the process stream at the butane isomerization section of alkylation unit No. 2. The gas is received in cylinders and introduced in a closed system.

Two chemicals, aluminum chloride and antimony trichloride (see Section No. 3 on these materials), used in process in the isomerization section of alkylation unit No. 2 give off hydrogen chloride gas readily in the presence of water.



# 28. HYDROGEN SULFIDE GAS

(Ref.: This section summarizes the best available information on the properties, characteristics, and poisonous effects of hydrogen sulfide and the hazards of its commonly encountered companion material, iron sulfide. It is based on the March, 1948 issue of the API Toxicological Review on Hydrogen Sulfide, the API Accident Prevention Manual No. 1-A, dated March, 1942, the Petroleum Refiner of December, 1948, page No. 139, and the Oil and Gas Journal of March 5, 1931, page No. 153.)

## A. EMERGENCY TREATMENT FOR HYDROGEN SULFIDE POISONING

A person who is unconscious or not breathing in an atmosphere which may be contaminated with hydrogen sulfide should be assumed to have hydrogen sulfide poisoning. This is a serious medical emergency which requires immediate treatment. The affected individual should be removed from the contaminated atmosphere as quickly as possible, care being taken to insure that rescuers are not also overcome. The victim should be kept warm and at complete rest. Artificial respiration should be instituted at once if breathing is interrupted. Severe pain in the eyes from conjunctivitis (inflammation of the mucous membrane which covers the eyes and lines the inner surface of the eye lids) may be controlled by hot or cold compresses. Sum-

mon medical assistance at once, but keep the person breathing.

## B. PRECAUTIONARY MEASURES—HYDROGEN SULFIDE GAS—REFINERY

Portable breathing appartus, with eye protection incorporated into the mask equipment, should be available wherever exposure to hydrogen sulfide is expected, and shall be worn by workmen when it is necessary to enter potentially contaminated areas.

Whenever workers must enter areas where hydrogen sulfide may accumulate. or must open tanks containing oils bearing hydrogen sulfide for gauging or other purposes. they shall work in pairs so that one man will be available for rescue purposes if his fellow workman is overcome. Workers shall stand 90° to windward of hatches to avoid forming eddy currents. One man shall remain in a safe position near the head of the stairs while the other performs the work.

Each tank which contains sour crude or a refined product in which there is hydrogen sulfide in dangerous quantities shall be marked by a warning sign at the foot of the stairway. In addition, similar signs shall be placed at the firewall steps or other locations of tank entry at the firewall.

Firewall signs shall state: "Hydrogen sulfide—do not pass this point without



having portable breathing apparatus immediately available."

Tank stair signs shall state: "Hydrogen sulfide—safety breathing apparatus must be in use at all times beyond this point."

Pumprooms in which hydrogen sulfide may accumulate shall be provided with ventilating facilities which will remove vapors from the floor level, and shall be provided with portable breathing apparatus. The tops of stairs to such pumprooms shall bear signs stating "Hydrogen sulfide—do not pass this point without approval of pumper." Before authorizing personnel to descend into such pumprooms, the pumper shall ascertain that the pumproom ventilating facilities are operating satisfactorily. If the ventilating facilities are not operating properly, all personnel descending the stairs shall wear portable breathing apparatus until an instrument test reveals that the atmosphere is safe for personnel.

Several operating units are concentrating $H_2S$ to near 100%. These are the three catalytic cracking units and pipe still No. 3. Facilities in these units having high $H_2S$ concentrations are the sour water strippers at C.C.U. No. 1 and pipe still No. 3 and the Girbitol sections at C.C.U. Nos. 2 and 3.

The majority of the refinery gas streams including the refinery fuel gas contain an appreciable quantity of $H_2S$ (1000+ppm). Tests have indicated that the release of

gas even in the streams containing the highest content of $H_2S$ during normal procedure for sampling and bleeding sample and instrument lines is not hazardous. In these cases the $H_2S$ concentration is diluted to a negligible quantity at a distance of 1½ to 2 feet from the point of release. As a precaution; however, personnel should stand to one side of the point of release of the gas stream.

Additional precautions should be taken when extensive venting of a gas stream is necessary from a location, such as a flange, where personnel are required to work. Personnel should stand to one side of the location of release of gas. In case there is an accumulation of gas at the work location that would be indicated by the odor, a lead acetate ampoule should be used to detect the presence of $H_2S$.

Work orders for opening lines and equipment which are known to contain sour crude or its products must specify this information.

## C. DESCRIPTION OF HYDROGEN SULFIDE

The chemical formula for hydrogen sulfide is $H_2S$. Its molecular weight is 34.08, boiling point is—76.2°F., and specific gravity is 1.192 with respect to air. (Heavier than air.)

Hydrogen sulfide is a colorless, transparent gas with a characteristic rotten-egg



odor. It burns in air with a pale blue flame and forms an explosive mixture with air. It is an extremely unpleasant and dangerous contaminant which is encountered in the production, transportation, and refining of high sulfur crude oils. Particular difficulty is encountered with Mexican and West Texas crudes, which may contain considerable quantities of sulfur. Highly poisonous concentrations of hydrogen sulfide may be encountered in the air above crude oil or distillates contained in tanks, barges, or other vessels.

Hydrogen sulfide is combustible in concentrations of 4.3 to 46.0 percent in air.

## D. HYDROGEN SULFIDE CONCENTRATIONS

Small amounts of hydrogen sulfide may be smelled and inhaled with no harm and no other results; however, even low concentrations of hydrogen sulfide may have serious effects if the exposure is of sufficient duration. The American Standards Association and most states have established the concentration of 20 parts per million (ppm) as the maximum permissible concentration of hydrogen sulfide for workers exposed during an eight-hour working day. Concentrations of hydrogen sulfide of less than 1 ppm have a noticeable odor, and higher concentrations are distinctly unpleasant. The odor intensities of various concentrations of hydrogen sulfide may be summarized as follows:

0.022 ppm—no odor
0.13 ppm—minimum perceptible odor
0.77 ppm—faint, but readily perceptible
4.6 ppm—Easily noticeable, moderate
27.0 ppm—strong, unpleasant, but not intolerable.

The effects of exposure to various concentrations of hydrogen sulfide may be summarized as follows:

50 to 100 ppm—
Slight conjunctivitis (inflammation of the mucous membrane which covers the eyes and lines the inner surface of the eye lids) and respiratory tract irritation after one hour.

100 ppm—
Coughing, eye irritation and loss of smell after 2 to 15 minutes, Altered respiration, pain in the eyes, and drowsiness after 15 to 30 minutes, followed by throat irritation after one hour. Prolonged exposure results in a gradual increase in the severity of these symptoms, with death occurring in 8 to 48 hours.

200 to 300 ppm—
Marked conjunctivitis (eye irritation) and respiratory tract irritation after one hour of exposure.

500 to 700 ppm—
Loss of consciousness and possibly death in one-half to one hour.



700 to 900 ppm—
Rapidly produces unconsciousness, cessation of respiration and death.

Over 1000 ppm—
Unconsciousness at once, with early cessation of respiration and death in a few minutes. Death may occur even if individual is removed to fresh air at once.

It will be noted that the loss of the sense of smell occurs even in the presence of relatively low concentrations of hydrogen sulfide. From this it is concluded that if the gas is smelled and the odor disappears, the workman may still be in a dangerous concentration of hydrogen sulfide but has lost his sense of smell temporarily. The workman shall proceed at once to a reliable source of fresh air if this occurs.

## E. PRECAUTIONARY MEASURES

Towers, tanks, and vessels which contain iron sulfide deposits shall be thoroughly steamed and flooded with water before being opened. If this is not feasible, ventilate the vessel, using an air eductor or blower, simultaneously apply water fog, and break up sediment with grounded-nozzle high-pressure water stream through manholes. Inasmuch as this operation may release gases, continue tests for gases. Iron sulfide deposits removed from a vessel shall be buried, burned, or deposited under water. Drain, pump, or syphon sour water and

sediment to sewer. Notify separator personnel of sour water in sewer. Entrained gas or vapors may be liberated by agitation of sediment incidental to removal of iron sulfide deposits from vessels. For this reason, employees shall wear portable breathing apparatus while they remove sediment, unless tests prove the absence of toxic vapors and gases. Men may enter vessels without portable breathing apparatus to preform "cold work" when all of the following are complied with:

(a) Vessel is clean
(b) Vessel is free of hydrogen sulfide
(c) Combustible gas concentration is less than 20 percent of the lower explosive limit
(d) Connections to vessel are blinded.

Before hot work may be performed, the vessel shall test gas free and be free of oil.

The steaming operation in open vessels shall be conducted at as high rate as possible consistent with pressure limitations of the vessel, to reduce the hazard of static electricity from the steaming operation igniting oil or vapors. Steam lines, if used for heating and ventilating tanks, shall be grounded to the tank shell to prevent static accumulation.

Suction and discharge lines, hollow columns supporting roofs, and similar liquid traps shall be drained and/or flushed with water.



Air supplied to masks from air blowers shall be uncontaminated. For this reason the air blower shall be placed upwind from the vessel being cleaned in fresh, uncontaminated air. All fittings on the hose and mask shall be tight, and there shall be no leaks around the face piece. Before putting on a mask, the employee shall remove his hat and clean his mouth of tobacco or snuff. The employee operating an air blower shall give his undivided attention to his assignment. He shall continue to operate the blower until the other employees have removed their masks. A saddle or pad shall be placed over the edge of a manhole to protect the fresh air hose leading to the mask from becoming damaged.

If there is a possibility of toxic vapors within the vessel, men blinding lines and removing manhole covers shall wear adequate breathing apparatus.

Hydrogen sulfide vapors are heavier than air and travel a considerable distance. If ignited, they may flash back to the vessel and cause a serious fire. It is desirable on calm days to gas test the area and low places near the vessel. This is particularly desirable when gasoline engine pumps and other portable equipment are used in the area.

## F. HOW IRON SULFIDE IS FORMED

When hydrogen sulfide comes in contact with iron, there is a tendency for the sulfur

and the iron to combine to form iron sulfide. When sour crudes have been moved from a well to a refinery, in two or more transferring operations the crude will usually weather sufficiently that hydrogen sulfide does not cause dangerous accumulations of iron sulfide. However, all personnel should be alert to the possibility that iron sulfide may be present in tanks, vessels, exchangers, compressors, and other equipment if sour crude has been handled. Iron sulfide deposits usually will accumulate in the upper parts of tanks and other vessels, in exchanger bundles, compressors, and instrument pots. Generally, it is found in the overhead streams in the refining processes.

### G. IRON SULFIDE REACTS WITH AIR

Iron sulfide absorbs oxygen from the air very rapidly and the reaction is accompanied by a sudden rise in temperature. The development of heat is so rapid that a deposit of iron sulfide may be heated to redness and in the presence of suitable vapors or liquids will cause fire. When such deposits are formed in towers, stills, and other favorable places where there are petroleum vapors, explosions and fires may result on the admission of air, unless suitable precautions are taken as discussed in Section D.

## 29. LIME-HYDRATED

Hydrated lime, calcium hydrate [$Ca(OH)_2$], is finely divided white powder resembling wheat flour or baking powder.



Hydrated lime is formed by slaking quicklime with the requisite amount of water, and since a chemical reaction with water has already taken place, it is less hazardous to handle than quicklime as used in plastering. However, it is a mild skin irritant, capable of causing irritation both chemically by its akaline action and mechanically where clothes rub the body.

Lime is used at the water treating plants.

## 30. LITHARGE

(Ref.: Industrial Hygiene & Toxicology, Volume II.)

Litharge is a compound of lead (lead oxide) in powder form, and is capable of producing lead poisoning. It is a fine yellow powder.

Generally speaking, there are two means for the entrance of litharge into the human body under industrial conditions: (a) through the lungs by inhalation; and (b) by swallowing dust particles trapped in the upper respiratory tract or introduced into the mouth on food, fingers, etc.

Exposure to litharge can have both acute and chronic effects on the body. Therefore, prolonged or frequently repeated exposure to relatively low concentrations is hazardous, and may have essentially the

same effects as a few instances of inhalation or ingestion of larger quantities. These hazards can be avoided by observing usual rules of personal cleanliness and wearing a lead dust respirator (not the ordinary nuisance dust respirator).

## 31. MALEIC ANHYDRIDE

(Ref.: Label on Shipping Container)

Pure maleic anhydride is a snow white crystalline solid, pulverized into particles ranging from powder to small flaky chips.

Skin contact with maleic anhydride or a solution of maleic anhydride will cause burns. Particular care should be exercised to prevent contact with the eyes. Inhalation of dust or solution vapors may cause irritation of the respiratory tract.

Maleic anhydride is used at the toluene unit during production of nitration grade toluene.

## 32. MERCURY

(Ref.: API Toxicological Review, Sept., 1948, Mercury)

Mercury is a heavy, silvery metal which is liquid at ordinary temperatures. It is toxic, capable of producing both acute and chronic poisoning, and may enter the body by inhalation, skin contact, or ingestion. Acute mercury poisoning is seldom



encountered as a result of industrial exposure. Chronic poisoning may result from frequent skin contact or inhalation of low concentrations of mercury vapor or extremely fine droplets. Small amounts of mercury spilled on benches or floors tend to become increasingly finely divided, presenting a large surface area from which vaporization can take place. In addition, dust stirred up from such areas may contain considerable quantities of very finely divided particles of mercury.

It is usual to absorb mercury into the body without harm, and the body shows an increasing ability to excrete mercury if exposure is gradual. Recovery from overexposure to mercury usually is rapid (usually in a few weeks) on withdrawal from exposure.

The following working precautions should be observed in locations where mercury is used frequently:

1. Wash hands thoroughly after handling mercury. This reduces the liquid mercury hazard.
2. Store mercury in closed containers.
3. Clean up spills promptly and maintain adequate ventilation of areas where mercury is handled. This reduces the mercury vapor hazard.

## 33. MOLYBDENA-ALUMINA CATALYST (Hydroforming catalyst)

(Ref.: 1021 Answers and Safety Problems)

Molybdena--Alumina Catalyst is in the form of irregularly shaped pebbles approximately 1/4" to 5/16" diameter or regularly shaped pellets approximately 3/8" diameter. It is light gray in color, almost white, with a very slight greenish hue, possibly due to its molybdenum content.

This catalyst is non-toxic. The only health problem involved in its handling is as a nuisance dust when this catalyst is being charged in the hydroforming unit reactors.

## 34. PHENOL (CARBOLIC ACID)

(Ref.: API Toxicological Review, Phenol, September, 1948)

Pure phenol (carbolic acid) is a white, crystalline solid at ordinary temperatures. It melts to a water-white liquid at 105°F. Impure phenol is usually a liquid at ordinary temperatures.

Exposure of the skin to solutions of phenol will lead to the production of second- or third-degree burns unless the



material is removed within a very short time. In addition to flushing the exposed area with plenty of water, ethyl alcohol of 20-70 percent strength is helpful in removing the phenol, but early use of water is better than late use of alcohol.

The eyes are particularly sensitive to phenol solutions. Protracted flushing of the eyes with water should be started at once. **DO NOT USE ALCOHOL IN THE EYES.**

Skin exposure to any concentration is hazardous and should be reported to the Medical Department.

Phenol vapor is extremely hazardous and the safe maximum allowable limit for an 8 hour work day has been established at 5 parts per million.

Phenol is used at the toluene unit. Tests shall be made for phenol vapors per the list posted in the toluene unit control room.

## 35. PHOSPHORIC ACID CATALYST

Phosphoric acid catalyst consists of small cylindrically shaped pellets of relatively inert material impregnated with phosphoric acid. It is light gray in color.

Hazards involved in its handling are due to the phosphoric acid. Dust from the

catalyst becomes irritating when moist. This is noted particularly in the eyes and respiratory tract, and possibly on the skin.

Phosphoric acid catalyst is used in the polymerization section of CCU No. 2.

## 36. PLATINUM REFORMER CATALYST

(Ref.: Handbook of Dangerous Materials, N. I. Sax)

This material, Aeroform PHF-1, is used as a catalyst at the ultraforming units. The material is in small cylindrical pellets with dimensions of 1/8" x 1/8". It is gray in color and contains less than 1% platinum by weight. It is non-toxic and requires no special protection when handling except the use of dust respirators to guard against the dust nuisance caused by fines.

## 37. POTASSIUM PERMANGANATE

Pure potassium permanganate occurs as slender, dark purple, prismatic crystals. It is soluble in water, forming a purple solution.

Concentrated solutions of potassium permanganate are quite caustic, capable of causing burns on the skin. Relatively dilute solutions are irritating to the skin. Al-



though solutions of potassium permanganate are commonly used as antiseptics and antidotes to organic poisons, skin contact with solutions of greater than one percent concentration should be avoided except on authority of a physician. Do not take internally except as authorized by a physician.

A supply of potassium permanganate is maintained at No. 1 Storehouse for possible utilization in neutralizing tetraethyl lead.

## 38. SA-550

(Ref.: Standard Oil Company of Indiana Data Sheet - SA-550)

SA-550 is an additive used at the ethyl pump house introduced into some finished gasoline. The additive itself is obtained from Standard Oil of Indiana.

It is a flammable light amber liquid with a disagreeable odor. This material is moderately toxic and over exposure can produce restlessness, excessive saliva, tears, lack of coordination, labored breathing, diarrhea, and even convulsions and coma. Exposure may occur from inhaling vapor or mist or by skin absorption. In the eyes it will cause irritation. Do not breathe high concentrations of vapor or mist; avoid skin contact and eye splashes.

Employees connecting and disconnecting the 55 gallon drums of the material to the blending facilities should wear a face shield

and rubber gloves. If moving of drums into position to install the suction pipe is required, be sure the bung is in place to prevent splashing. Make sure bungs are put back in emptied drums so that persons picking up the empties will not be exposed to drainings.

In case of exposure to high concentrations of vapors such as may be occasioned while cleaning up spills, masks equipped with organic vapor canister or self-contained breathing apparatus (Scott Air-Pak) should be worn. In case of skin contact, wash promptly with soap and water. Soaked clothing should be removed promptly and laundered before being worn again. Any gotten in the eyes should be washed out with plenty of water and then get medical attention. Employees showing symptoms of overexposure should get medical attention immediately.

## 39. SC COLD CLEANER No. 49

(Ref.: Central Solvents & Chemicals Company booklet "Organic Solvents," copyright, 1950 and 1021 Answers to Industrial Health and Safety Problems)

All precautions and protection prescribed for the handling of Carbon Tetrachloride should be observed in handling this material.

SC Cold Cleaner No. 49 is a clear colorless liquid consisting of 25 percent methylene chloride, 5 percent perchlorethylene and 70 percent Stoddard Solvent naphtha. The toxic qualities of SC Cold Cleaner No. 49 are contributed by the methylene chloride and perchlorethylene contained in the cleaner. These materials are very similar to Carbon Tetrachloride with respect to their reaction on the human body. Since these materials are diluted with naphtha, SC Cold Cleaner No. 49 has about one-fourth the toxicity by volume compared with pure carbon tetrachloride.

Unlike carbon tetrachloride, SC Cold Cleaner No. 49 is flammable; however, it has a relatively high flash point (132°F. after 20 percent evaporated) with no flash point at its initial boiling point (108°F.).

SC Cold Cleaner No. 49 is used in this plant as a cleaning solvent in the same manner as carbon tetrachloride.

## 40. SILICA-ALUMINA CATALYST— (Catalytic Cracking Units)

Silica-alumina catalyst utilized here is composed of approximately 75 percent silica and 25 percent alumina. When fresh, it is a fine white powder which looks like flour. After use it darkens considerably.

Repeated tests have shown no silicosis hazard such as exposure to some forms of dust containing this silica. This may

be due to the fact that this silica is non-crystalline.

It is used at the three catalytic cracking units.

## 41. SILICA GEL

Silica Gel is used at several operating units for drying instrument air. It is in the form of small hard beads (identified commercially as Sova Bead) varying in size from 1/8" to 3/16" in diameter and in the form of irregular flakes. The material is translucent with a color ranging from light to dark amber. There are no hazards involved in the handling of this material.

## 42. SODA ASH

(Ref.: Handbook of Dangerous Materials, N. I. Sax.)

Soda ash, also known as sodium carbonate, is a white fine powder and is received in 100 lb. bags. The material is mixed with water in a small open tank located west of No. 1 separator. It is used as an emulsion breaker in the slop oils pumped from the separator. After proportionate mixing of 100 lbs. of soda ash to 1 bbl. of water, it is pumped to storage tanks 320 and 321.

Soda ash is a caustic material and the dust is irritating to the upper respiratory



tract and is particularly irritating to the eyes. Soda ash in solution is a skin irritant and in case of contact should be washed away with liberal quantities of water.

Persons exposed to the dust while mixing should wear dust respirator and goggles. Past experience in handling the material in powder form indicates that no additional protective clothing is necessary.

## 43. SODIUM DICHROMATE OR SODIUM BICHROMATE

(Ref.: The American Cyanamid Company label on shipping container)

Sodium dichromate or sodium bichromate is a bright orange colored compound in the form of needle-like crystals.

Containers in which this material is shipped carry the following warning label:

"Warning—Harmful Dust—May Cause Rash or External Ulcers.

"Keep container closed; avoid breathing dust or solution spray. Avoid contact with skin or eyes. Do not take internally.

In case of contact, immediately flush skin or eyes with plenty of water for 15 minutes.

For eyes get medical attention.

"Remove and wash clothing before reuse.

"Use fresh clothing daily. Take a hot shower after work using plenty of soap."

Actually sodium dichromate or sodium bichromate seldom presents much of a dust hazard because of the fact that it absorbs water from the atmosphere very readily. Irritation of the skin or eyes from contact is the worst hazard involved in its handling.

Sodium bichromate is used for cooling water treatment.

Sodium di or bichromate is used occasionally in ball form under the name Nalco 37. There is no dust hazard; however, hand protection should be used in handling this material.

## 44. SODIUM METASILICATE

This is a compound used for maintaining the silica content in boiler feed water. When dry it is a fine white granular substance. It absorbs moisture if left exposed and then takes on the appearance of caked salt. There is minor dusting when handling the material; however, it is non-toxic under such exposure conditions.

## 45. SODIUM PHOSPHATE

(Ref.: A Manual of Pharmacology)

There are several forms of sodium phos-



phate. The refinery uses monosodium phosphate, which is a snow white powder resembling baking soda; and sodium phosphate glass, which as the name implies looks like chips of broken white translucent glass, but does not have sharp cutting edges.

Sodium phosphate is a feeble alkali. It is non-irritating and non-toxic. Creation of a dust nuisance is possible in handling the powdered form of this material. Wear a respirator for prolonged exposure to the dust.

Sodium phosphate is used at the boiler water treating plants and for cooling water treating.

Sodium phosphate in ball form is used occasionally under the name of Nalco D-1543. There are no hazards involved in its handling.

## 46. SODIUM SULPHITE

(Ref.: A Manual of Pharmacology)

Sodium sulphite (Santosite) is a soft powder, very light tan in color—almost white.

Sodium sulphite is a non-toxic, non-irritating compound utilized in boiler water treating. Dust is the only problem to be considered. A respirator should be worn for prolonged exposure to sodium sulphite dust.

## 47. SULPHUR

(Ref.: Industrial Hygene and Toxicology; Accident Prevention Manual)

Sulphur is a non-metallic element, occurring in nature either in the free or combined state. As utilized industrially, sulphur is a light yellow powder, or a grainy sand-like material, depending on the extent of pulverization.

Sulphur is a very mild irritant and may possibly cause irritation to the eyes and to sensitive skins. A dust nuisance may exist in the handling of powdered sulphur. The use of respirators and goggles is advised for prolonged exposures.

## 48. SULPHURIC ACID

(Ref.: API Toxicological Review, Sulphuric Acid, March, 1948)

Uncontaminated sulphuric acid is a colorless, odorless, heavy liquid with an oily consistency which gets hot when mixed with water and may spatter. Commercial sulphuric acid may be yellow or brown in color due to the presence of impurities.

Sulphuric acid exerts a strong corrosive action on flesh. The severity of the burn produced is, in general, proportional to the strength of the acid and the length of the exposure. Serious poisoning from sulphuric acid vapors is unlikely since their irritant action to the respiratory tract and to the



eyes serves as ample warning to seek a pleasanter atmosphere.

Sulphuric acid is used at the water treating systems at various units, alkylation units, toluene unit, and in the separator effluent.

## 49. TBC (4-tertiary butylcatachol)

(Ref.: Information supplied by Amoco Chemicals Laboratory personnel.)

"TBC" is an abbreviation for a chemical identified as 4-tertiary butylcatachol. In the pure state, this material is a dark colored solid. It is received at this plant in 55 gallon red and white drums in a solution of 85% TBC and 15% water. This solution is dark in color.

This material is an additive introduced into the process stream at the toluene unit. Major exposure is while the drums are being connected or disconnected at the unit.

This material is a skin irritant and can cause burns. It is especially dangerous to the eyes. In case of skin contact, immediately wash skin with soap and water. In case of eye splashes, wash eyes thoroughly with water and get medical attention.

This material can be handled safely with normal care. It is recommended that face shields or goggles and rubber gloves be worn while connecting drums.



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## 50. TEFLON

(Ref.: Dupont memorandum "Toxicological Hazards in the Fabrication of "Teflon" Tetrafluoroethylene Resin)

"Teflon" tetrafluoroethylene resin is a white, hard substance with a smooth waxy appearance. It is used as a packing material in the refinery.

Teflon itself is completely non-toxic in its solid form, even as a dust. Animal tests have proved that the material is non-toxic when ingested and it does not produce any skin irritation.

### HAZARDOUS PROPERTIES

Although Teflon in its solid form is non-toxic, it can give off extremely toxic gases when heated above 400°F. in the presence of oxygen (in atmosphere). These toxic gases, given off in small quantities, are colorless and odorless and can cause serious damage to the lungs. The gases may be evolved by heating the material or by machining, since friction heat is generated in excess of 400°F.

Teflon heated in the presence of hydrocarbons gives off hydrofluoric acid vapors. Although highly irritant, this gas is not considered as insidious as that evolved when teflon is heated in the presence of oxygen, since HF can be detected visually and by its irritating action.

Since only small quantities of the material is machined at a time, and this is done at intervals, there is little danger of exposure from this cause if reasonable ventilating precautions are observed.



THE MOST HAZARDOUS ASPECTS OF THE HANDLING OF TEFLON IS THE EXPOSURE WHICH COULD RESULT IF THE DUST IS DEPOSITED ON TOBACCO TO BE SMOKED. There is the possibility that teflon dust can settle on the ends of cigarettes or other forms of smoking tobacco carried in workers' pockets and then be decomposed when the tobacco is smoked. In such cases, the fumes would be inhaled directly. Therefore, every effort should be made by those handling teflon to prevent contamination of smoking tobacco. For the same reason, teflon should be washed from the hands before smoking. Dust collecting on equipment as a result of machining operations should be eliminated in order that contamination can be avoided by those who may come in contact with the material without their knowledge.

## 51. TETRAETHYL LEAD

THE PROVISIONS SET UP IN THIS SECTION ARE SUPPLEMENTARY TO REGULATIONS IMPOSED BY MANUFACTURERS OF TETRAETHYL LEAD, AND IN NO WAY SHALL BE CONSTRUED AS TAKING PRECEDENT OVER MANUFACTURERS' REGULATIONS.

## A. DESCRIPTION OF TETRAETHYL LEAD HANDLING FACILITIES

Facilities for adding tetraethyl lead compound to gasoline, and probable concentrations of lead in various parts of the systems during leading operations, are shown on drawing No. B-3777-51.

Housebrand gasoline is leaded as follows: Pumps L-1 and L-4 in the Ethyl Pump House take suction on Housebrand blending tanks, either No. 501, 502, 503, or 504 through line No. 184 and discharge to the same tank through line No. 181. For Housebrand blending tanks 22 and 23 the suction lines are Nos. 144A, 322, and the discharge line is No. 331. A side stream is taken off line No. 181 or 322 to the suction of eductor pump L-21 in the Ethylizing Building through line No. 182. Pump L-21 discharges gasoline through an eductor which pulls lead compound from the weigh tank and mixes it with the flowing gasoline and back into line No. 181 or 322 through line No. 183. Thus lead enters the blending tank along with the circulated gasoline.

The aviation gasoline leading system duplicates the Housebrand system and involves the following equipment:

Tanks Nos. 24 and/or 25
Suction lines Nos. 181 and 189
Pumps Nos. L-5 and L-14 in the Ethyl



pump house and No. L-22 in the Ethylizing building.

Discharge lines Nos. 314 and 188.

## B. ROUTINE MAINTENANCE

The tetraethyl lead facilities shown on drawing No. B-3777-51 shall be assumed to contain dangerous concentrations of tetraethyl lead compound, and routine maintenance work shall be performed on these facilities only under the following conditions:

(1) Permission to perform work must be obtained from the pumper.

(2) All equipment for moving tetraethyl lead compound must be shut down and the lines and equipment on which work is to be performed shall have been washed thoroughly internally with gasoline in the normal gasoline circulating system.

(3) Precautions must be taken to avoid the breathing of and skin contact with, any tetraethyl lead compound or with gasoline containing this compound. ANY GASOLINE WHICH IS COLORED SHOULD BE CONSIDERED AS CONTAINING LEAD COMPOUND.

The tetraethyl lead unloading, transfer, and injection systems at the Ethylizing building (all piping between, above and north of valves Nos. 9 and 10 in each system including the reserve storage facilities) are the direct responsibility of the tetra-

ethyl fluid manufacturer, and no work shall be performed on this piping except in accordance with regulations of the tetraethyl fluid manufacturers.

C. DISPOSAL OF VALVES, FITTINGS, AND PIPE

Valves, fittings, and pipe which are retired from service in the undiluted tetraethyl lead compound system (piping between, above and north of valves Nos. 9 and 10 in each injection system, including the reserve storage facilities) shall be disposed of by inserting in a firebox. When the materials reach a temperature characterized by a cherry red color, they become inert and may be handled as ordinary scrap at the next shutdown of the firebox.

D. TANK CLEANING AND DISPOSAL OF LEAD SLUDGE

Cleaning of tanks which have contained leaded gasoline at any time subsequent to a prior cleaning shall be performed under the direction of a representative of a manufacturer of tetraethyl lead. Lead sludge removed from these tanks shall be buried at a location where necessity for future excavation is unlikely, **and the exact location of such buried sludge shall be reported to the Engineering Department, Design and Development Division, for recording on pertinent drawings.** Locations of buried lead sludge are shown on utility and oil line drawings of the 5001 and 5002 series. Buried lead sludge does not become inert, and shall not be excavated except under the direction of a representative of



a manufacturer of tetraethyl lead.

E. EMERGENCIES — LEAKS AND SPILLS

In the event of a sizable leak or spill in the area of the facilities occupied by the leading equipment as shown on drawing No. B-3777-51, the following steps should be taken:

(1) Immediately clear the area of all personnel, to such a distance that there is no chance of breathing vapors from the spill, until it has been determined whether tethaethyl lead compound is involved in the spill.

(2) Notify the Pumping and Gauging division of the location and extent of leak or spill. The Pumping and Gauging Division will determine whether there has been a loss of lead and what precautions are necessary in salvage and repair operations, and must immediately notify a representative of the designated tetraethyl lead manufacturer.

F. MAINTENANCE OF RELATED EQUIPMENT

(1) **In Ethylizing Building, and in Area of Reserve Storage Tank Immediately North of Ethylizing Building**

It is regarded as safe from the standpoint of tetraethyl lead poisoning for employees to paint or to work on the electrical system, unit heaters, plumbing, steam

piping, foam and sprinkling systems, eductor pumps and drivers under the following conditions:

(a) Permission to enter the building and perform maintenance work as described above must be obtained from the Pumper supervisor or Pumper. Work shall be performed under the supervision of Ethyl Pump House personnel.

(b) All equipment for moving tetraethyl lead must be shut down and must have been thoroughly washed internally with gasoline in the normal gasoline circulating system.

(c) All precautionary signs and regulations must be observed regarding skin contact with tetraethyl lead compound or inhalation of its vapors.

(2) In Ethyl Pump House

Work on pump Nos. L-1, L-4, L-5, L-14, and L-36 shall be governed by the provisions under item B of this section.

Work may be performed on other equipment in the ethyl pump house so long as there are no serious leaks of leaded gasoline or strong odors of gasoline which might contain lead.

## 52. TOLUENE

(Ref.: API Toxicological Review, Toluene, March, 1948)



Toluene is a colorless liquid with a not unpleasant odor in low concentrations and a rather disagreeable odor in higher concentrations.

Contact with toluene is generally confined to skin contamination following spillages, leaks, or breaks in process equipment. Hazard from toluene vapor is not likely except among personnel who are exposed to it without adequate ventilation.

Toluene exerts a mildly irritant action on flesh. Flush the exposed area with plenty of water. Any extensive exposure, either by skin contact or inhalation, should be reported to the Medical Department.

Toluene vapor is combustible in concentrations of 1.27 to 7.0 percent in air.

The American Standards Association and most states have recommended a toluene vapor concentration of 200 ppm as the acceptable limit for exposures not exceeding 8 hours daily. A majority of individuals will note definite eye and throat irritations when exposed to toluene concentrations as high as 300 ppm.

Suitable protection should be worn when exposure is anticipated.

## 53. TRETOLITE L-52244

Tretolite is a dark oily substance received in 55 gallon drums and is used as an emulsion breaker at No. 1 separator.

It is pumped into the system by inserting a connecting pipe into the bung opening with the drum in an upright position. There are no hazards connected with its handling since it is non-toxic and non-irritating.

## 54. UNOX PENETRANT

Unox penetrant is a wetting agent mixed in proportions of one or two percent with water for use in fire extinguishment either as a solution or as foam. It is stored in closed containers and mixed into the fire water stream in a closed system on the 750 GPM pumper fire truck, and the high pressure pumper fire truck.

Unox is a clear honey colored liquid with a consistency of light weight motor oil.

Unox solution or foam has a strong detergent action and may cause drying and flaking of the skin after prolonged exposure. It should be washed from the skin as soon as practicable after contact. It is non-toxic and no special precautions are necessary.

## 55. XYLENE

(Ref.: Elkins, "Chemistry of Industrial Toxicology")

Xylene is a clear, colorless liquid with a characteristic aromatic odor.

Xylene is similar to toluene in its effects. It is somewhat more irritant than toluene



but its lower volatility generally renders it less hazardous.

Contact with xylene is generally confined to skin contamination following spills, leaks, or breaks in process equipment. Hazard among xylene vapor is not likely except among personnel who are exposed to it without adequate ventilation.

Xylene exerts a mildly irritant action on flesh. Flush the exposed area with plenty of water. Any extensive exposure, either by skin contact or inhalation, should be reported to the Medical Department.

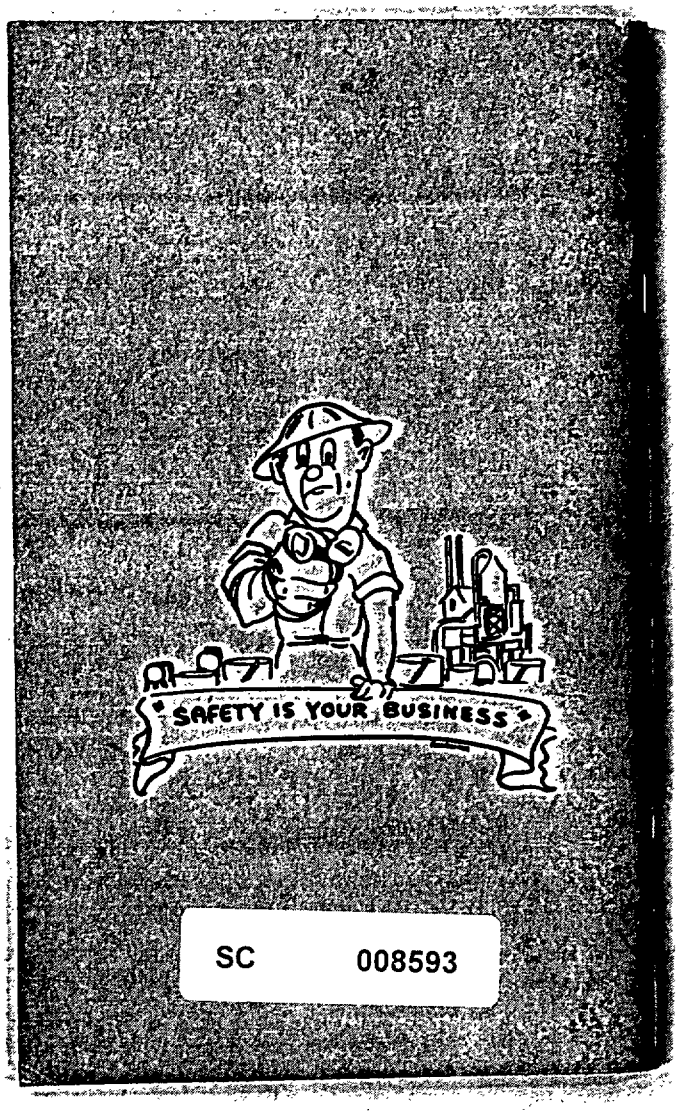
Xylene vapor is combustible in concentrations of 1 to 5.3 percent in air.

The American Standards Association have recommended a xylene vapor concentration of 200 ppm as the acceptable limit for exposure not exceeding 8 hours daily.

Suitable protection should be worn when exposure is anticipated.

## 56. ZEOLITE

Zeolite or Nalcite HCR (trade name) is a sand colored material somewhat coarser than sand and with more uniform grains. It is placed as a bed in the zeolite drums for softening water. Handling is infrequent since it is charged on a permanent basis. There are no hazards involved in its handling.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