COUNTRY FIRE AUTHORITY.

WASTE DISPOSAL SITE.

FISKVILLE TRAINING CENTRE.

REPORT No. 72024

DATE 1/7/1988

GEOTECHNICAL INVESTIGATION

BY

A. S. JAMES PTY. LTD.

1.01 Investigation requested by: Mr. P. Aldred, Country Fire Authority.

1.02 Purpose of Investigation: Industrial Waste has been buried in a small site at the Fiskville Training Centre and it was required to determine the nature of the waste and to recommend an appropriate long term approach to future utilisation of the area.

1.03 Local Geology: Quaternary basalt deposits consisting of residual clays overlying boulder or weathered rock.

1.04 Field methods: Consisted of disturbed sampling from excavated test pits.

2. RESULTS

2.01 From observations on site it would appear disposal had been in a series of three trenches each trench being some 20 - 30m. in length and the drums placed in these trenches.

Typical drums were pierced and/or removed when damaged and samples taken at locations 1 - 9. A test pit was also excavated at Location 10 and some 3.0 - 4.0m away and samples taken of the clay.

2.02 Samples were sent to East Melbourne Laboratories for Chemical Analysis and their report is attached as Appendix 1. This report is self explanatory and does not require further comment.

2.03 In order to define the properties of the clay further Atterberg Limit testing has been carried out and the results are given on Figure 2.

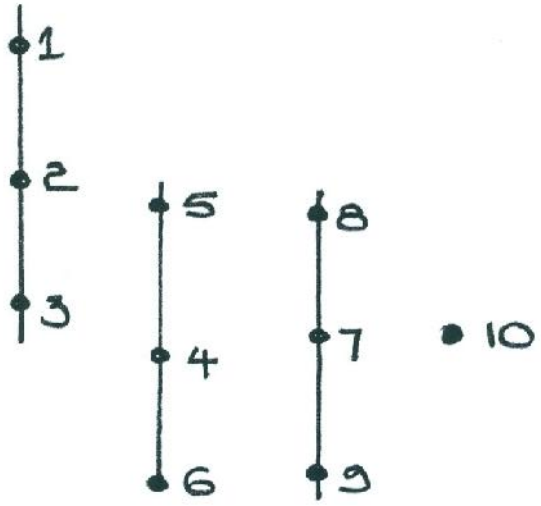
These tests define the clay as CH in accordance with the Unified Classification System and equally as a material of low permeability.

3.01 We enclose Appendix 2 being extracts from Sax 'Dangerous Properties of Industrial Materials' 4th Edit. (1975) Van Nostrand which discuss some of the major constituents identified and would comment that on the basis and from remarks in the report by E.M.L. precautions should be taken to ensure that the waste is disposed or confined.

While it would appear that little significant contamination of the adjacent soil has occurred it must be accepted that if the chemicals are to remain in place there will be long term break down of the containers. The affect of this could be restricted by, in effect, forming an "unbrella" over and around the storage area by the placement of an impermeable membrane with permanently welded or glued joints. Such a membrance should be spread over and turned down at the perimeters in trenches taken to a depth equivalent to at least the storage depth and the surface should be covered and the surface should be covered with soil or alternative protective surfacing. Details of suitable membranes can be obtained from such organisations as the Nylex Corporation, 25 Nepean Highway, Mentone or Sarlon Industries, 95 Bell Street, Coburg.

Even with this approach it is thought that there must be a risk of some leacheat eventually reaching the ground water system. It is difficult if not impossible to forecast the time span or concentration but nevertheless the risk must be there and should be recognised. If this risk is not acceptable then the materials should be removed from the site and disposed in a suitable manner. In this regard there are commercial organisations which specialise in this and one such organisation would be Cleanaway which has been operating a disposal system near Tullamarine Airport.

3.02 We understand concern has also been expressed as to the influence of the materials on human contact and would comment that this is not within our area of expertise and medical and or legal advice should be sought.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Geotechnical Engineers

DATE

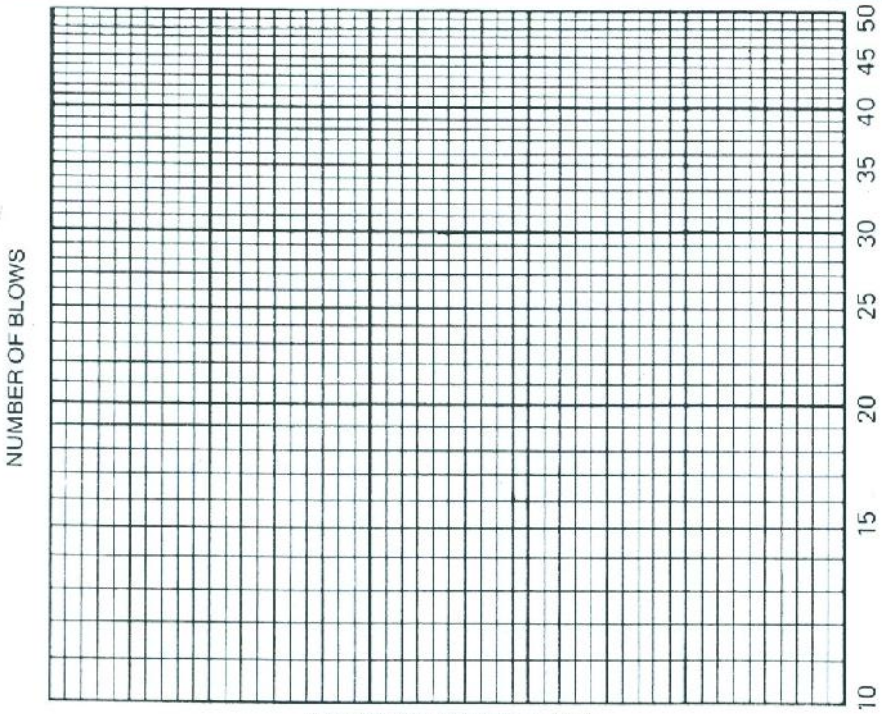
SAMPLE No.: 10660 BORE No.: 10 DEPTH: 0.8.

SAMPLE DESCRIPTION: GREY BROWN CLAY.

CONDITION OF SAMPLE: NATURAL / AIR-DRIED / OVEN-DRIED / UNKNOWN		BOWL No.
SIEVING METHOD: WET / DRY	PASSING 0.425mm SIEVE ..... %	CURING TIME: .....

LIQUID LIMIT, W_L — L.L. Machine No.					Number of blows	Factor	PLASTIC LIMIT, W_P	
Container No.					15	0.95		
Container and Wet Soil	g				16	0.96		
Container and Dry Soil	g				17	0.96		
Container	g				18	0.97		
Moisture Loss	g				19	0.97		
Dry Soil	g				20	0.98		
Moisture Content	%	93.0	94.0	87.3.	21	0.98	31.3	29.4.
Number of Blows		24	25		22	0.99	Ave. %	
					23	0.99		
					24	1.00		
					25	1.00		
					26	1.00		
					27	1.01		
					28	1.01		
					29	1.02		
					30	1.02		
					31	1.02		
					32	1.03		
					33	1.03		
					34	1.03		
					35	1.03		

METHOD — OVEN DRYING
ONE POINT FACTOR ..... W_L = FACTOR × W .....%



LINEAR SHRINKAGE	
Mould No.	
Initial Length mm	
Final Length mm	
Longitudinal Shrinkage mm	
LS %	21.1.

Liquid Limit, W_L	%	94
Plastic Limit, W_P	%	30
Plasticity Index, I_P	%	64.
Linear Shrinkage, LS	%	21.1.

Tested JP Figure

APPENDIX 1

REPORT EAST MELBOURNE LABORATORIES 31/5/1988

FAX: (03) 836 0517

THE EAST MELBOURNE LABORATORIES
PROPRIETARY LIMITED
CONSULTING CHEMISTS AND MICROBIOLOGISTS
(Incorporated in Victoria)

425-427 Canterbury Road, Surrey Hills, Victoria. 3127

OUR REF.: 42,836

YOUR REF.:

A.S. James Pty.Limited,
15 Libbett Avenue,
Clayton South,
Victoria 3169

31st May,1988

Attention Mr. T. Holt

Dear Sirs,

re: Examination of Soils and Waters from C.F.A.Tip Site

Ten samples of the above, delivered to the laboratory on 6th May 1988, were examined by Infra Red Spectroscopy and computer aided data reduction in an attempt to identify the principle chemical types present at the site.

Unfortunately sample identifications were destroyed due to the use of a solvent soluble pen by the sampler. They are nevertheless described by their appearance as follows:-

EML File Ref.	Description
16	No. 3 Amber Gum
17	No.10 Clay
18	Soil Sample
19	Brown Liquid in Jar
20	Black Granular Sample
21	Orange Clay Solution
22	No.3 Soil Sample
23	Clay Sample
24	Brown Liquid
25	Brown Liquid Clay

All samples were extracted with dichloromethane to remove organic compounds for characterisation. This pretreatment excludes inorganic materials such as metals or salts, which remain behind.

Dichloromethane extracts were evaporated on Potassium Bromide windows and the infra red spectrum of the residue was measured between 4000 cm^{-1} and 400 cm^{-1} using a Hitachi Model 270-30 ratio recording Infra Red Spectrophotometer.

Copies of spectra obtained are attached.

These data were then subjected to computer analysis for functional groups. In this process absorbtion bands are compared with known patterns corresponding to the various vibrational frequencies characteristic of the molecule, and results are produced in the form of a probability of the presence of a particular species. A probability of 1.00 indicates the certain presence of a specific compound but in a situation where mixtures of chemicals are present such precision is rarely obtained.

The search was programmed to report only those groups with a probability of 0.8 or better. Experience suggests that such data will reliably identify the major components of a gross mixture, but it should be remembered that other materials will certainly be present in lesser amounts.

The Table below summarises the results obtained and demonstrates the similarity of the various samples.

Sample File	16	17	18	19	20	21	22	23	24	25
Aromatic Ring	+		+		+	+	+	+	+	+
Monosubstituted - C_6H_5	+		+		+	+	+	+	+	+
1-2 Substituted - $C6H_4$	+		+				+			+
Furan ring -	+					+	+	+		
Aromatic Tertiary Amine - Nitrile or Thiocyanate -			+							
Pyridine ring - Non Aromatic Thiocyanate -									+	+
Phenol or Aromatic Ring and Hydroxyl -			+		+	+	+	+		
Aromatic Halogenated Compound -				+		+		+		
Methyl-CH_3				+						
Isopropyl -				+						
Dimethyl -				+						
Tertbutyl -				+						
Double Bond C = C	+							+		

It will be seen that two samples fall outside the general description that emerges from the data. One of these, File No. 17 - No.10 Clay - would appear to represent a clean, uncontaminated sample whilst the other - File No.19 - Brown Liquid in jar - would appear to be composed chiefly of aliphatic (i.e. paraffinic) species.

The remainder consistently demonstrated the presence of an aromatic ring group, principally monosubstituted,although other materials were also present, notably furan rings. Monosubstituted - C_6H_5 is synonymous with Phenol or Aromatic Ring and hydroxyl, which tends to reinforce the primary data.

continued.....

It can therefore be concluded that the principle contaminant at the site consisted of aromatic compounds i.e. resins or solvents, and may include benzene toluene, Xylene and phenol. Materials of this type are only slowly biodegraded and their presence would normally constitute an environmental problem.

Should there be any queries regarding this work, please do not hesitate to contact us.

Yours faithfully
THE EAST MELBOURNE LABORATORIES PTY. LIMITED

M.K.Gledden B.Sc.

APPENDIX 2

EXTRACTS SAX 'DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS' 4th EDIT. (1975) VAN NOSTRAND.

X

XANTHOGEN DISULFIDE
Hazard Analysis and Countermeasures
Details unknown. See sulfides.

o-XENOL. See *o*-phenylphenol.

XENON
General Information
Colorless, gaseous element.
Formula: Xe.
At wt: 131.30, d (gas): 5.8878 g/l, d (liquid): 3.52 at −109°C, mp: −112°C, bp: −107.1°C.
Hazard Analysis
Toxicity: A simple asphyxiant. For a discussion of toxic effects see argon. A common air contaminant.
Radiation Hazard: For permissible levels see Section 5, Table 5. Artificial isotope ^{131m}Xe, T½ = 12d. Decays to stable ^{131}Xe via γ's of 0.16 MeV. Artificial isotope ^{133m}Xe, T½ = 2.3d. Decays to radioactive ^{133}Xe via γ's of 0.23 MeV. Artificial isotope ^{133}Xe, T½ = 5.3d. Decays to stable ^{133}Cs via β's of 0.35 MeV. Also via γ's of 0.08 MeV. ^{133}Xe is produced by neutron radiation of stable ^{132}Xe in air-cooled reactors. Artificial isotope ^{135}Xe, T½ = 9h. Decays to radioactive ^{135}Cs via β's of 0.91 MeV. Also via γ's of 0.25 MeV. ^{135}Xe is produced by neutron irradiation of stable ^{134}Xe in air-cooled reactors.
Countermeasures
Storage and Handling: Section 7.
Shipping Regulations: Section 11.
Regulated by IATA.

XENON DIFLUORIDE
General Information
Colorless crystalline solid, stable at room temperature. Easily sublimed and has a significant vapor pressure at 20°C. A colorless vapor with a powerful fluorine odor, water soluble.
Formula: XeF_2.
Mol wt: 169.3, mp: 140°C, vap. p.: 3.8 mm at 25°C, d: (solid) 4.32.
Hazard Analysis
Toxicity: It is moderately toxic. Its vapor hydrolyzes to form highly toxic hydrofluorides. Caution: Must be stored and handled as a very powerful fluorine type of oxidizer. In the presence of even traces of moisture, it will attack glass and metals.
Countermeasures
See hydrofluoric acid and fluorides.

XENYLAMINE. See *p*-aminodiphenyl.

XENYLAMINE ANTI-OXIDANT. A recognized carcinogen (Section 8). See aromatic amines.

X-RAY FILM (NITROCELLULOSE BASE)
Hazard Analysis and Countermeasures
See nitrates.
Shipping Regulations: Section 11.
Regulated by CG, DOT, IATA.

X-RAY FILM SCRAP (NITROCELLULOSE BASE)
Shipping Regulations: Section 11.
Regulated by CG, DOT.

X-RAY FILM (NITROCELLULOSE BASE), UNEXPOSED
Shipping Regulations: Section 11.
Regulated by CG, DOT.

X-RAYS
General Information
Highly penetrating electromagnetic radiation produced by electrical means.
Hazard Analysis
Radiation Hazard: A recognized carcinogen (Section 8). See ionizing radiation and gamma rays (Section 5A).

X-RAY PRIMARY PROTECTIVE BARRIER NEEDS. See Section 5A.

X-RAY. SECONDARY PROTECTIVE BARRIER NEEDS. See Section 5A.

m-XYLENE *
General Information
Synonym: *m*-xylol.
Colorless liquid.
Formula: $C_6H_4(CH_3)_2$.
Mol wt: 106.2, mp: −47.9°C, bp: 139°C, lel = 1.1%, uel = 7.0%, flash p.: 84°F, d: 0.864 at 20°/4°C, vap. press.: 10 mm at 28.3°C, vap. d.: 3.66, autoign. temp.: 982°F.
Hazard Analysis
Toxic Hazard Rating:
Acute Local: Irritant 1.
Acute Systemic: Inhalation 2; Skin Absorption 2.
Chronic Local: Irritant 1.
Chronic Systemic: Inhalation 2; Skin Absorption 2.
Note: A common air contaminant. Oral MLD (rats) = 4 g/kg.
Fire Hazard: Dangerous, when exposed to heat or flame; can react with oxidizing materials.
Explosion Hazard: Moderate, in the form of vapor when exposed to heat or flame.
Disaster Hazard: Dangerous. Keep away from open flame.
Countermeasures
Ventilation Control: Section 2.
To Fight Fire: Foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).
Personnel Protection: Section 2.
Storage and Handling: Section 7.
Shipping Regulations: Section 11.

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

0 NONE: (a) No harm under any conditions; (b) Harmful only under unusual conditions or overwhelming dosage.
1 SLIGHT: Causes readily reversible changes which disappear after end of exposure.
2 MODERATE: May involve both irreversible and reversible changes not severe enough to cause death or permanent injury.
3 HIGH: May cause death or permanent injury after very short exposure to small quantities.
U UNKNOWN: No information on humans considered valid by authors.

which constitute vitamin E. These vitamin constituents are viscous oils; sol. in lipid solvents; insol. in water.

Hazard Analysis

Toxic Hazard Rating: U. Used as chemical preservative, nutrient, and/or dietary supplement food additives (Section 10).

TOE PUFFS

General Information

Toe puffs are box toe boards used in the manufacture of boots and shoes and may consist of several layers of fabric impregnated with celluloid solvent, rosin, and dye.

Hazard Analysis

Toxic Hazard Rating: U.

Fire Hazard: Dangerous. They are liable to spontaneous combustion.

Countermeasures

Shipping Regulations: Section 11.

Regulated by IATA.

TOLAMINE. See sodium *p*-toluenesulfonchloramine.

TOLAN. See diphyl acetylene.

***o*-TOLIDINE.** A recognized carcinogen (Section 8). See aromatic amines.

***o*-TOLIDINE FLUOSILICATE**

General Information

Small white crystals; slightly sol. in alcohol.

Formula: $(C_6H_3NH_2CH_3)_2 \cdot H_2SiF_6$.

Mol wt: 356.4, mp: 269°C.

Hazard Analysis and Countermeasures

See fluosilicates and fluorides.

TOLUENE *

General Information

Synonyms: methylbenzene; phenylmethane; toluol.

Colorless liquid; benzol-like odor.

Formula: $C_6H_5CH_3$.

Mol wt: 92.13, mp: −95°C to −94.5°C, bp: 110.4°C, flash p.: 40°F (C.C.), ulc: 75–80, lel = 1.27%, uel 7.0%, d: 0.866 at 20°/4°C, autoign. temp.: 947°F, vap. press.: 36.7 mm at 30°C, vap. d.: 3.14.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 1.

Acute Systemic: Ingestion 2; Inhalation 2; Skin Absorption 1.

Chronic Local: Irritant 1.

Chronic Systemic: Ingestion 2; Inhalation 2; Skin Absorption 2.

Toxicology: Toluene is derived from coal tar, and commercial grades usually contain small amounts of benzene as an impurity. Acute poisoning, resulting from exposures to high concentrations of the vapors, are rare with toluene. Inhalation of 200 ppm of toluene for 8 hours may cause impairment of coordination and reaction time; with higher concentrations (up to 800 ppm) these effects are increased and are observed in a shorter time. In the few cases of acute toluene poisoning reported, the effect has been that of a narcotic, the workman passing through a stage of intoxication into one of coma. Recovery following removal from exposure has been the rule. An occasional report of chronic poisoning describes an anemia and leucopenia, with biopsy showing a bone marrow hypoplasia. These effects, however, are less common in people working with toluene, and they are not as severe.

Exposure to concentrations up to 200 ppm produces few symptoms. At 200 to 500 ppm, headache, nausea, loss of appetite, a bad taste, lassitude, impairment of coordination and reaction time are reported, but are not usually accompanied by any laboratory or physical findings of significance. With higher concentrations, the above complaints are increased and in addition, anemia, leucopenia and enlarged liver may be found in rare cases.

A common air contaminant.

Fire Hazard: Dangerous, when exposed to heat or flame.

Spontaneous Heating: No.

Explosion Hazard: Moderate, when exposed to flame.

Disaster Hazard: Moderately dangerous; when heated, it emits toxic fumes; can react vigorously with oxidizing materials.

Countermeasures

Ventilation Control: Section 2.

To Fight Fire: Foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Personnel Protection: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by IATA.

1-*o*-TOLUENEAZONAPHTHYLAMINE-2. See yellow OB.

2,4-TOLUENEDIAMINE

General Information

Synonym: tolylenediamine.

Prisms.

Formula: $CH_3C_6H_3(NH_2)_2$.

Mol wt: 122.17, mp: 99°C, bp: 280°C, vap. press.: 1 mm at 106.5°C.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2.

Acute Systemic: Ingestion 2; Inhalation 2.

Chronic Local: U.

Chronic Systemic: Ingestion 2; Inhalation 2.

Toxicology: This material has a marked toxic action upon the liver and can cause fatty degeneration of that organ. It is also thought to be an irritant. When solutions of it come in contact with the skin, it can cause irritation and blisters, particularly to individuals who are sensitive to it.

Disaster Hazard: Moderately dangerous; when heated, it emits toxic fumes.

Countermeasures

Ventilation Control: Section 2.

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by IATA.

2,5-TOLUENDIAMINE

General Information

Synonyms: 2,5-tolylenediamine; 2,5-diaminotoluene.

Colorless, crystalline tablets.

Formula: $CH_3C_6H_3(NH_2)_2$.

Mol wt: 122.17, mp: 64°C, bp: 274°C.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2.

Acute Systemic: Ingestion 2; Inhalation 2:

Chronic Local: U.

Chronic Systemic: Ingestion 2; Inhalation 2.

Toxicology: This material has a toxic action upon the liver and can cause fatty degeneration of that organ. Its total effect upon the body seems to take

* This material has been assigned a Threshold Limit Value by ACGIH. See complete reprint of TLV's in Section 1.

Note: For an in-depth discussion of storage and handling

General Information
Synonym: mandelonitrile.
Yellow viscous liquid.
Formula: $C_6H_5CH(OH)CN$.
Mol wt: 133.14, mp: −10°C, bp: 170°C decomposes, d: 1.124.
Hazard Analysis
Toxicity: Details unknown, but probably highly toxic. See also cyanides and nitriles.
Disaster Hazard: See cyanides.
Countermeasures
Storage and Handling: Section 7.

BENZALKONIUM CHLORIDE
General Information
Synonym: zephiran chloride.
White or yellowish-white powder. Aromatic odor. Very bitter taste.
Formula: alkyl dimethyl benzylammonium chlorides.
Hazard Analysis
Toxic Hazard Rating:
Acute Local: Irritant 1; Ingestion 2.
Acute Systemic: Ingestion 2.
Chronic Local: Irritant 1.
Chronic Systemic: U.
A bactericide and fungicide. Oral LD_{50} (frogs) = 30 mg/kg.
Disaster Hazard: Dangerous. See chlorides.

BENZALMALONONITRILE
General Information
Crystals.
Formula: $C_6H_5CH_2CH(CN)_2$.
Mol wt: 156.2.
Hazard Analysis
Toxicity: Highly toxic, see cyanides.
Disaster Hazard: See cyanides.
Countermeasures
Storage and Handling: Section 7.

BENZANTHRONE
General Information
Pale yellow needles.
Formula: $C_{17}H_{10}O$.
Mol wt: 230.25, mp: 174°C, vap. press.: 1 mm at 225.0°C.
Hazard Analysis
Toxicity: Unknown.
Fire Hazard: Slight; when heated (Section 7).
Countermeasures
Storage and Handling: Section 7.

2-BENZAZINE. See isoquinoline.

3,4-BENZCHRYSENE. See picene.

"BENZEDRINE"
General Information
Synonym: amphetamine.
Liquid.
Formula: $C_9H_{13}N$.
Mol wt: 135.20, bp: 200°C, flash p.: 80°F (O.C.), d: 0.931, vap. d.: 4.65.
Hazard Analysis
Toxic Hazard Rating:
Acute Local: 0.
Acute Systemic: Ingestion 2; Inhalation 2.
Chronic Local: 0.
Chronic Systemic: Ingestion 1; Inhalation 1.
Caution: A Stimulant. Overdoses cause hyperactivity, restlessness, insomnia, rapid pulse, rise in blood pressure, dilated pupils, dryness of the throat.
Fire Hazard: Dangerous; when exposed to heat or flame; can react with oxidizing materials.
Disaster Hazard: Dangerous, upon exposure to heat or flame.
Countermeasures
Ventilation Control: Section 2.
Personal Hygiene: Section 2.
Treatment and Antidotes: Evacuation of stomach if taken by mouth, sedatives. Call a physician.
To Fight Fire: Carbon dioxide or dry chemical or carbon tetrachloride (Section 7).
Storage and Handling: Section 7.

BENZENE *
General Information
Synonyms: benzol; phenyl hydride; coal naphtha.
Clear colorless liquid.
Formula: C_6H_6.
Mol wt: 78.11, mp: 5.51°C, bp: 80.093°–80.094°C, flash p.: 12°F (C.C.), d: 0.8794 at 20°C, autoign. temp.: 1044°F, lel: 1.3%, uel: 7.1%, vap. press.: 100 mm at 26.1°C, vap. d.: 2.77.
Hazard Analysis
Toxic Hazard Rating:
Acute Local: Irritant 2; Ingestion 1; Inhalation 1.
Acute Systemic: Ingestion 2; Inhalation 2; Skin Absorption 2.
Chronic Local: 0.
Chronic Systemic: Ingestion 3; Inhalation 3; Skin Absorption 3.
Toxicology: Poisoning occurs most commonly through inhalation of the vapor, though benzene can penetrate the skin, and thus contribute to poisoning.

Locally, benzene has a comparatively strong irritating effect producing erythema and burning, and in more severe cases, edema and even blistering (Section 9). Exposure to high concentrations of the vapor (3,000 ppm or higher) results from accidents such as failure of equipment or spillage. Such exposure, while rare in industry, may result in acute poisoning, characterized by the narcotic action of benzene on the central nervous system. The anesthetic action of benzene is similar to that of other anesthetic gases, consisting of a preliminary stage of excitation followed by depression and, if exposure is continued, death through respiratory failure.

The chronic, rather than the actue form of benzene poisoning is important in industry. It is a recognized carcinogen of the blood-forming tissues. There is no specific blood picture occurring in cases of chronic benzol poisoning.

The bone marrow may be hypoplastic, normal, or hyperplastic, the changes being reflected in the peripheral blood. Anemia, leucopenia, macrocytosis, reticulocytosis, thromocytopenia, high color index, and prolonged bleeding time may be present. Cases of myeloid leukemia have been reported. For the supervision of the worker, repeated blood examinations are necessary, including hemoglobin determinations, white and red cell counts and differential smears. Where a worker shows a progressive drop in either red or white cells, or where the white count remains below 5,000 per cu. mm., or the red count below 4.0 million per cu. mm., on two successive monthly examinations, he should be immediately removed from exposure.

Following absorption of benzene, elmination is chiefly through the lungs, when fresh air is breathed. The portion that is absorbed, is oxidized, and the

* This material has been assigned a Threshold Limit Value by ACGIH. See complete reprint of TLV's in Section 1.

Note: For an in-depth discussion of storage and handling and control of fires see Section 7.