



Report Prepared for:

Kmart Corporation
Construction Department
3100 West Big Beaver Road
Troy, Michigan 48084-3163

Attention: Mr. Richard G. Williams

ADDENDUM
SAFETY INFORMATION & CONTINGENCY PLAN
FORMER AMERICAN NATIONAL CAN SITE
3801 EAST EIGHTH STREET
OAKLAND, CALIFORNIA

AUGUST 31, 1995

James P. Dunn, R.G.
Associate Geologist
PES Environmental, Inc.

Richard S. Krentz, CIH
Sterling & Associates



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1.0 GENERAL INFORMATION

1.1 Background Information

This Addendum to the Safety Information and Contingency Plan¹ (Plan) was prepared by PES Environmental, Inc. (PES) for Kmart Corporation for the use of contractors performing activities related to redevelopment and/or construction on a portion of the subject site, located at 3801 East Eighth Street in Oakland, California (refer to Plate 1). More specifically, the addendum provides specific information for contractor activities slated for the Temporary Soil Storage Area located in the southeastern corner of the site (refer to Plate 2).

The subject site, formerly referred to as the American National Can Company (ANC) Oakland facility, has been used to manufacture food and beverage cans from approximately 1917 to 1988. Warehousing activities continued until the facility closed in 1991. The ANC facilities were demolished in mid-1994. The planned redevelopment of the site is for a Super Kmart store, a fast-food restaurant, associated parking, and landscaped areas. Construction of these new facilities is nearing completion. The Kmart is scheduled to open in November 1995. Construction of the parking lot in areas outside the Temporary Soil Storage Area is in progress at this time. Construction within the Temporary Soil Storage Area needs to commence on August 31, 1995 to meet construction schedules.

Prior to redevelopment activities and as a result of environmental investigations conducted by ANC and its environmental consultants, contaminated soil was excavated and removed from several areas on the site under the guidance of Alameda County Department of Environmental Health (ACDEH), Cal/EPA-Department of Toxic Substances Control (DTSC), and California Regional Water Quality Control Board (RWQCB). Excavated soils from two areas (the RCRA-permitted drum storage area and the RCRA-permitted solder dross storage area) were staged in the Temporary Soil Storage Area prior to arranging for off-site transportation and disposal.

Upon removal of the excavated soils from the Temporary Soil Storage Area, ANC sampled the ground surface in this area and analyzed the samples for organic and inorganic chemical constituents. The results of the analysis showed detectable concentrations of several chemicals which ANC has attributed to historical activities unrelated to the recent soil stockpiling. Further discussion of the detected chemical constituents are presented in Section 2.0.

1.2 Scope and Objective

Because remedial cleanup operations for contaminants from the former ANC facility were completed by the end of July 1995, the Kmart construction site, as well as the Temporary Soil Storage Area, is not a hazardous waste facility under Title 8, California Code of Regulations, Section 5192 [Hazardous Waste Operations and Emergency Response (HAZWOPER)].

¹ PES Environmental, Inc., 1995. *Safety Information & Contingency Plan, Former American National Can Site, 3801 East Eighth Street, Oakland, California.* March 3.

The construction activities also do not qualify as operations under the HAZWOPER safety order. Nevertheless, for construction of the new project, the RWQCB and ACDEH required that a site safety and contingency plan be prepared to provide for worker safety and health, resulting in the aforementioned March 3, 1995 Plan. Additionally, DTSC has requested additional precautions be taken within the Temporary Soil Storage Area, resulting in preparation of this Addendum to the Plan.

The primary objective of this Addendum, in conjunction with the Plan, is to ensure the well-being of construction personnel and other contractors that may work in the Temporary Soil Storage Area. To accomplish this objective, construction personnel and other contractors/subcontractors working in the Temporary Soil Storage Area will be provided, via this document and safety meetings, with an understanding of: (1) the site background conditions and potential chemical hazards from surface and potential subsurface contaminants in this area, and (2) appropriate work methods and practices specific to the Temporary Soil Storage Area to avoid chemical exposure.

Information regarding general work methods and practices as well as information regarding local emergency services in the event of an exposure to chemical contaminants are provided in Section 3.0. All such workers shall be informed of the policies and procedures established herein during an initial information meeting conducted prior to commencement of activities in the subject area and during onsite tailgate meetings to be conducted by site supervisors. The information and tailgate meetings shall follow protocols outlined in the Plan.

Section 4.0 describes an air monitoring plan to verify that construction workers within the Temporary Soil Storage Area are not exposed to chemical hazards of concern.

2.0 DETECTED CHEMICAL CONSTITUENTS

Chemical analysis of surface soil samples in the Temporary Soil Storage Area identified concentrations of the following chemical constituents:

- Total Petroleum Hydrocarbons (TPH) quantified as diesel;
- TPH quantified as mineral spirits;
- Organic lead;
- Hexavalent Chromium;
- Inorganic Lead; and
- Zinc.

The analytical results indicate that TPH quantified as diesel and mineral spirits were identified in the surface soil samples at concentrations up to 5,900 milligrams per kilogram (mg/kg) and 2,900 mg/kg, respectively. Organic lead was identified in three of the surface soil samples at concentrations ranging from 0.65 mg/kg to 9.6 mg/kg. Hexavalent chromium was identified in one duplicate sample at a concentration of 0.11 mg/kg. Total lead and zinc were identified at concentrations ranging from 6.1 to 360 mg/kg and 27 to 320 mg/kg, respectively. As indicated by ANC and its environmental consultant, the petroleum and lead constituents are likely present in the surface soil due to: (1) oil treatment as part of historical construction of asphalt surfaces formerly present in the Temporary Soil Storage Area, or (2) other non-specific historical activities, such as former railroad spur tracks. Because hexavalent chromium was: (1) not detected in most samples, (2) was not found at the RCRA storage area, (3) was not included in ANC's waste streams, and (4) it was detected in the single duplicate sample at a concentration just greater than the laboratory detection limit, PES believes the data is unreliable and not representative of soil conditions.

In addition to the aforementioned constituents, concern has been raised by the DTSC over the potential presence of semi-volatile organic chemicals (SOCs) which may be present at concentrations below laboratory detection limits but above site-specific performance standards for closure of ANCs former RCRA-permitted storage facilities. Because no listed SOC's were detected in surface soil samples, selection of particular SOC's for discussion of potential health effects has been based on findings of previous sampling and chemical analysis conducted in the two former RCRA-permitted storage areas (the origin of the previously stockpiled soil). In these two areas, SOC's detected in one or more soil samples included naphthalene and bis (2-ethylhexyl)phthalate. Naphthalene was identified in two samples at concentrations ranging from 0.76 to 4.1 mg/kg. Bis(2-ethylhexyl)phthalate was identified in four samples at concentrations ranging from 0.37 to 4 mg/kg.

A discussion of potential health effects of the total petroleum hydrocarbons quantified as diesel and mineral spirits and inorganic metals was presented in the Plan. The following information pertains to the remaining detected constituents, organic lead and the aforementioned SOC's identified in soils in one or both of the two former RCRA storage areas. In addition to the

information provided below, further details on the chemical constituents identified or potentially present in Temporary Soil Storage Area are found in the Material Safety Data Sheets (Appendix A).

Organic Lead

Organic lead is a colorless liquid usually dyed red, orange or blue and has a slightly musty odor. It has an extremely high vapor density, greater than 8 times that of air and is used primarily as a gasoline additive to prevent engine knock. Organic lead is an organometallic compound which can be readily absorbed through the skin. Toxic levels can be absorbed through the skin even if airborne levels of the chemical are within acceptable levels. Organic lead affects the central nervous system (CNS), with symptoms such as psychosis, mania, convulsions, etc. Other acute effects include: insomnia, lassitude, anxiety, tremors, heart irregularities hypotension, pallor, nausea, anorexia, hallucinations, convulsions, and coma.

Naphthalene

Naphthalene has an aromatic odor, and in its pure form is characterized by white crystalline, volatile flakes. Naphthalene is insoluble in water. Naphthalene is a human poison by ingestion and possibly other routes, an experimental tumorigen and reproductive affector. Exposure to naphthalene can also cause nausea, headache, diaphoresis, hematuria, fever, anemia, liver damage, vomiting convulsions and coma. Naphthalene is flammable when exposed to heat or flame, and is explosive in the form of dust or vapor when exposed to heat or flame.

Bis (2-ethylhexyl)phthalate

Bis(2-ethylhexyl)phthalate (also known as dioctyl phthalate or DOP) is a light-colored liquid with a slight odor. When heated to decomposition it emits an acrid smoke. This chemical is a suspected human carcinogen and has tetratogenic effects in laboratory animals. DOP is a mild skin and eye irritant. The inhalation of significant concentrations of DOP vapors is not likely due to its low vapor pressure.

3.0 POTENTIAL HAZARDS & CONTROLS

The planned future use of the Temporary Soil Storage Area is parking and driveways for the new Super Kmart retail center. Construction activities in this area will include minor grading, and irrigation and electrical infrastructure installation, prior to construction of an asphalt surface cover. Based on these planned activities, worker safety issues have been divided into three categories based on the potential degree of exposure. These categories include:

(1) equipment operators who will have no contact with surface soils, with the exception of ingress and egress to heavy equipment, (2) construction personnel who will work or move on the surface of the Temporary Soil Storage Area with minimal or no disturbance of the soil, and (3) construction personnel whose activities require disturbance of the surficial and near-surface soils. Control measures for each of these categories are provided in the following paragraphs. These activities and corresponding controls are specific to the Temporary Soil Storage Area. Information on general work practices and controls can be found in the Plan.

All contractors will have established and enforce its Code of Safe Practices. The Code of Safe Practices are to be followed by construction personnel and are designed to provide construction safety procedures in conforming with the Cal/OSHA Construction Safety Orders.

3.1 Activity Type 1 - Construction Vehicle Traffic

Activity:

Activity Type 1 covers personnel in any type of heavy equipment or other vehicle driving or working on the surface of the Temporary Soil Storage Area.

Control Measures:

- Vehicular traffic in this area will be limited to construction vehicles which are directly involved with the project. This includes heavy equipment, as necessary, to conduct trenching and grading, water truck, and street vehicles, when necessary, to transport construction supplies to work areas within the Temporary Soil Storage Area.
- Dust generation in the Temporary Soil Storage Area will be controlled utilizing water spray suppression techniques. If dust is generated when vehicles drive upon the Temporary Soil Storage Area, traffic will be suspended until additional dust suppression is implemented. Dust suppression using water spray techniques has proved successful during construction activities to date.
- Driving on the soils in this area will not be allowed unless the soil has been adequately moistened to minimize dust generation.
- If noticeable vapors or dusts are encountered within this area, or upon notification by the Industrial Hygienist, vehicles shall drive with the windows and vents in the closed position.

- Air monitoring will be conducted during soil disturbing activities within the Temporary Soil Storage Area. If construction personnel identify odors which are sustained over a period of 5 minutes, the Industrial Hygienist should be notified immediately as to the location and circumstances of the odor. Air monitoring will be conducted by the Industrial Hygienist in accordance with Section 4.0 of this document.
- Eating, smoking or drinking in the Temporary Soil Storage Area will not be allowed.
- Contractors will not park vehicles in the Temporary Soil Storage Area.

3.2 Activity Type 2 - Grading Contractor Foot Traffic (Soils Not Disturbed)

Activity:

Activity Type 2 includes personnel walking across or working on the surface of the Temporary Soil Storage Area, but not excavating or otherwise disturbing the soil. An example of this type of activity is surveying or grade checking.

Control Measures:

- Vehicular traffic in this area will be limited to construction vehicles which are directly involved with the project. This includes heavy equipment, as necessary, to conduct trenching and grading, water truck, and street vehicles, when necessary, to transport construction supplies to work areas within the Temporary Soil Storage Area.
- Pedestrian traffic in this area will be limited to those personnel authorized to conduct construction activities within the Temporary Soil Storage Area.
- Dust generation in the Temporary Soil Storage Area will be controlled utilizing water spray suppression techniques. If dust is generated when vehicles drive upon the Temporary Soil Storage Area, traffic will be suspended until additional dust suppression is implemented.
- Walking on soil surfaces which are visibly stained will be avoided.
- If soil or mud accumulates on the footwear of workers the soil should be removed at this location prior to entering vehicles or leaving the area. This gross decontamination can be accomplished by scraping the boot or using an appropriate hand tool.
- Air monitoring will be conducted during soil disturbing activities within the Temporary Soil Storage Area. If construction personnel identify odors which are sustained over a period of 5 minutes, the Industrial Hygienist should be notified immediately as to the location and circumstances of the odor. Air monitoring will be conducted by the Industrial Hygienist in accordance with Section 4.0 of this document.
- Eating, smoking or drinking in the Temporary Soil Storage Area will not be allowed.
- Contractors will not park vehicles in the Temporary Soil Storage Area.

3.3 Activity Type 3 - Trenching/Otherwise Disturbing the Soil

Activity:

Activity Type 3 includes personnel involved in digging, moving, or otherwise disturbing soils in the Temporary Soil Storage Area. These activities may include trenching for utilities and construction of foundations for parking lot light standards.

Control Measures:

- Vehicular traffic in this area will be limited to construction vehicles which are directly involved with the project. This includes heavy equipment, as necessary, to conduct trenching and grading, water truck, and street vehicles, when necessary, to transport construction supplies to work areas within the Temporary Soil Storage Area.
- Pedestrian traffic in this area will be limited to those personnel authorized to conduct construction activities within the Temporary Soil Storage Area.
- Dust generation in the Temporary Soil Storage Area will be minimized utilizing water spray suppression techniques. If dust is generated when vehicles drive upon the Temporary Soil Storage Area, traffic will be suspended until additional dust suppression is implemented.
- Walking on soil surfaces which are visibly stained will be avoided.
- If soil or mud accumulates on the footwear of workers, the soil shall be removed at this location prior to entering vehicles or leaving the area. This gross decontamination can be accomplished by scraping the boot or using an appropriate hand tool.
- Handling of the soils in this area will be avoided whenever possible. If handling of soil in this area is necessary, chemical protective gloves will be worn. Chemical protective glove composition should include nitrile, neoprene, or butyl. Following handling of the soil, hands and other exposed skin surfaces should be washed prior to eating, drinking or smoking.
- Clothing worn during work in the Temporary Soil Storage Area shall be laundered daily or a disposable protective coverall shall be used and disposed of on a daily basis.
- Eating, smoking or drinking in the Temporary Soil Storage Area will not be allowed.
- Contractors will not park vehicles in the Temporary Soil Storage Area.
- Air monitoring will be conducted during soil disturbing activities within the Temporary Soil Storage Area. If construction personnel identify odors which are sustained over a period of time 5 minutes, the Industrial Hygienist should be notified immediately as to the location and circumstances of the odor. Air monitoring will be conducted by the Industrial Hygienist in accordance with Section 4.0 of this document.

4.0 SITE MONITORING

Site monitoring will be performed using personal sampling methods, dust monitoring equipment, and organic vapor monitoring during activities at the Temporary Soil Storage Area to evaluate potential exposure during construction activities. All construction operations in the Temporary Soil Storage Area, which will involve contact with the soil, will be observed by a Certified Industrial Hygienist (CIH) or his/her designated representative.

To the extent feasible, the presence of airborne contaminants will be evaluated through the use of direct-reading instrumentation. Personal sampling methods will be utilized for Poly-Nuclear Aromatics (PNAs) and airborne lead. Since these chemicals cannot be detected by direct-reading instrumentation, dust levels will be monitored. Dust generated during site operations will be assumed to contain levels of these contaminants. A MINIRAM portable dust/aerosol monitor will be used to evaluate real-time dust levels during construction activities. Further, the laboratory results from the integrated air sampling will provide quantitative data as to the concentration of potential contaminants within the dust.

The following air monitoring equipment will be utilized during activities within the Temporary Soil Storage Area:

- Integrated air samplers (personal and area industrial hygiene sampling)
- MINIRAM dust/aerosol monitor
- Photoionization Detector

Integrated Sampling

Industrial hygiene sampling pumps will be employed to evaluate potential exposures to PNAs and airborne lead. These monitoring operations will provide background levels and an indication of potential worker exposures during construction activities within the Temporary Soil Storage Area.

Personal sampling pumps (i.e. Gil-Air) draw a fixed volume of air at a constant rate through the sampling media. The pumps will be calibrated daily at the beginning and end of each shift. The sampling media and method blanks will be submitted to an American Industrial Hygiene Association (AIHA) accredited laboratory for analysis. The specific analytical protocols are NIOSH Method 7082 for lead and NIOSH Method 5506 equivalent for the PNAs (scan for 16 common PNAs). Sample results will be calculated based on an 8-hour Time-Weighted Average (TWA), and compared to the applicable Permissible Exposure Limits (PEL) as adopted by Cal/OSHA.

Dust Monitoring (direct-reading)

Dust monitoring will be conducted using a direct-reading MINIRAM (Model PDM-3). Dust generated while potentially contaminated soils are being handled, agitated, or otherwise disturbed, will be assumed to be laden with lead dust. Lead dust was chosen due to the fact that it was detected in the soil at concentrations greater than other aerosol-type contaminants.

Additionally, lead has one of the lowest PELs of the identified chemicals within the Temporary Soil Storage Area.

A site action level for dust of 0.8 mg/M^3 has been established for the protection of construction workers within the Temporary Soil Storage Area. This level was established by using a mass-balance calculation as described in Appendix C. Based on the highest level of lead in the soil (360 ppm), 0.8 mg/M^3 represents a potential exposure to lead at the action level of 0.03 mg/M^3 .

Actual dust levels will be calculated by taking the indicated level and subtracting the established background level. Through continuous monitoring, background levels will be determined by monitoring the site upwind of construction activities and/or establishing dust concentrations at the property line. The MINIRAM will be used at various locations throughout the Temporary Soil Storage Area, depending upon daily activities.

Note that the MINIRAM has a detection limit of 0.01 mg/M^3 . Equipment specifications for the MINIRAM are included in Appendix B of this report.

Organic Vapor Monitoring

During construction activities within the Temporary Soil Storage Area, monitoring of organic vapors will be conducted using a portable Photoionization Detector (PID). Monitoring will be conducted with a Photovac HL-2000 or Thermoenvironmental 580B to characterize the potential for exposure to organic vapors. Monitoring will be conducted during initial site screening, during establishment of background levels, and during site activities within the Temporary Soil Storage Area.

A site action level of 1 ppm has been established for organics, based on benzene due to its low PEL. This level is based upon concentrations within the breathing zone and should be sustained for 5 minutes.

SITE ACTION LEVELS

Air Monitoring Instrument	Concentration of Concern
Integrated Sampler (personal/area)	per applicable Permissible Exposure Limit
MINIRAM aerosol (dust) monitor	0.8 mg/M^3 *
Photoionization Detector (PID)	1 ppm (sustained) **

* based on the maximum level of lead in soil and the PEL for airborne lead

** based on PEL for benzene

Heat Stress Monitoring

Being that impermeable, chemical protective clothing will not be worn, heat stress is not considered to be a major hazard associated with the construction activities within the Temporary Soil Storage Area. Nevertheless, the following recommendations have been established in order to reduce the impact of heat stress. Their applicability is dependent on evaluating the conditions particular to a specific project.

- Provide plenty of liquids to replace loss of body fluids. Appropriate liquids should consist of juices, juice products, and water.
- Establish a work schedule that will provide sufficient rest periods for cooling down. As the temperature increases, more frequent and longer rest periods are required.

Heat stress may be of concern depending upon the ambient temperature and amount of solar load. If significantly high ambient temperatures exist during work within the Temporary Soil Storage Area, then heat stress can be monitored by various means, the first being oral temperature. Oral temperature shall be recorded at the beginning of the workshift, and throughout the work-day. If the individual has an increase in body temperature of 1°F, the person should be relieved until the temperature returns to normal.

Obviously, utilizing an oral thermometer introduces an element of exposure through ingestion. Therefore, pulse-rate becomes the method of choice. Heart rates should be measured periodically by taking 30 second pulse rates at the end of a work period (i.e. beginning of rest period). If the heart rate exceeds 110 beats/min. at the beginning of the rest period, shorten the next work period by 1/3, keeping the rest period the same.

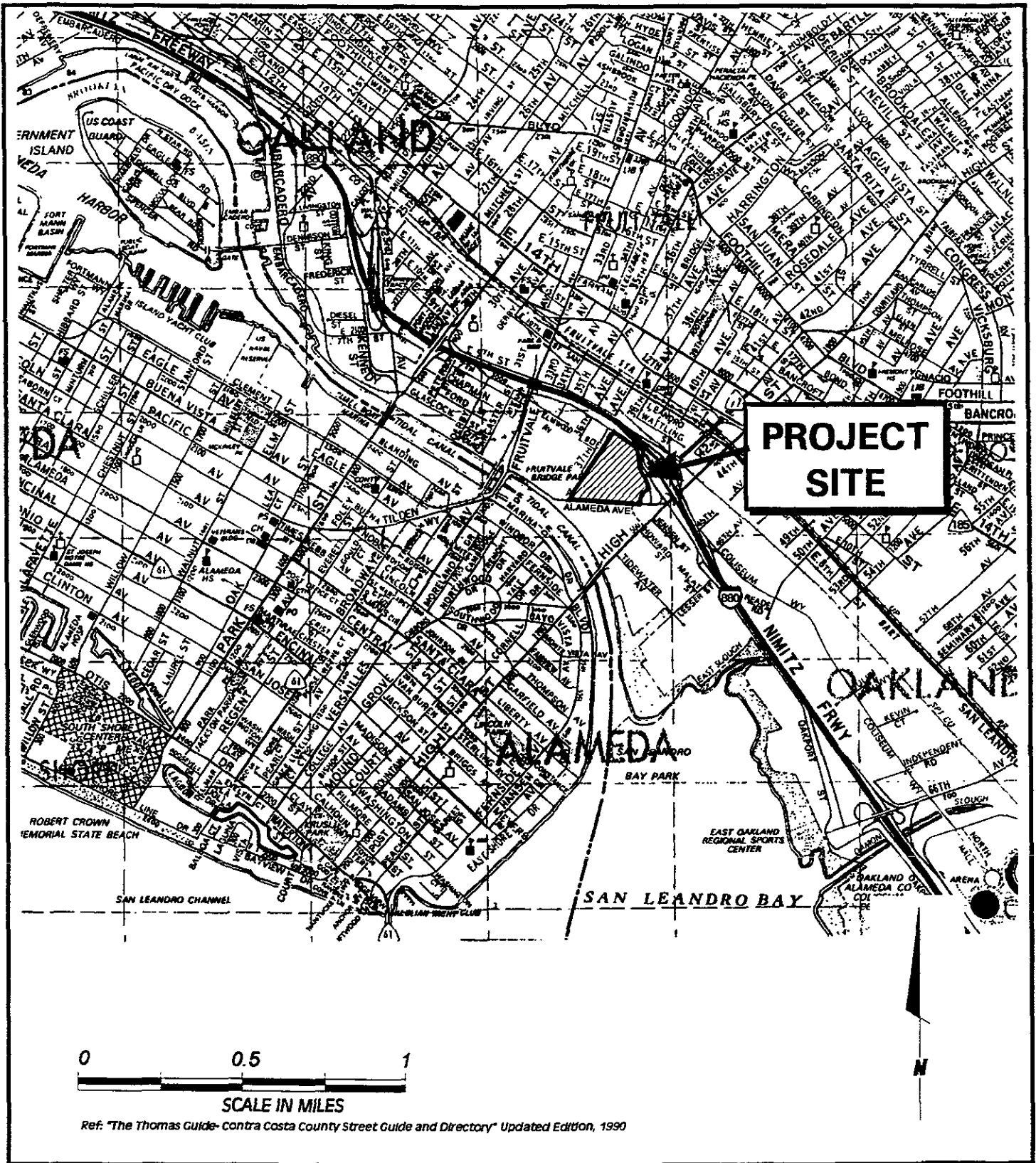
If the heart rate still exceeds 110 beats/min. at the next rest period, shorten the work cycle by 1/3. The following table has been developed for frequency of monitoring for acclimatized workers:

<u>Adj. Temp(°F)</u>	<u>Normal Work Clothes</u>	<u>Impermeable Clothes</u>
90.0	after @ 45 min. work	after @ 15 min. work
87.5-90.0	after @ 60 min. work	after @ 30 min. work
82.5-87.5	after @ 90 min. work	after @ 60 min. work
77.5-82.5	after @ 120 min. work	after @ 90 min. work
72.5-77.5	after @ 150 min. work	after @ 120 min. work

NOTE: Adjusted temperature must be calculated to utilize the chart above. Temperature is adjusted for solar loading via the following formula:

$$^{\circ}\text{F}_{\text{adj.}} = ^{\circ}\text{F}_{\text{ambient}} + (13 \times \% \text{ sunlight})$$

ILLUSTRATIONS



PES Environmental, Inc.
Engineering & Environmental Services

Site Location Map
Former American National Can Site
3801 East Eighth Street
Oakland, California

PLATE

1

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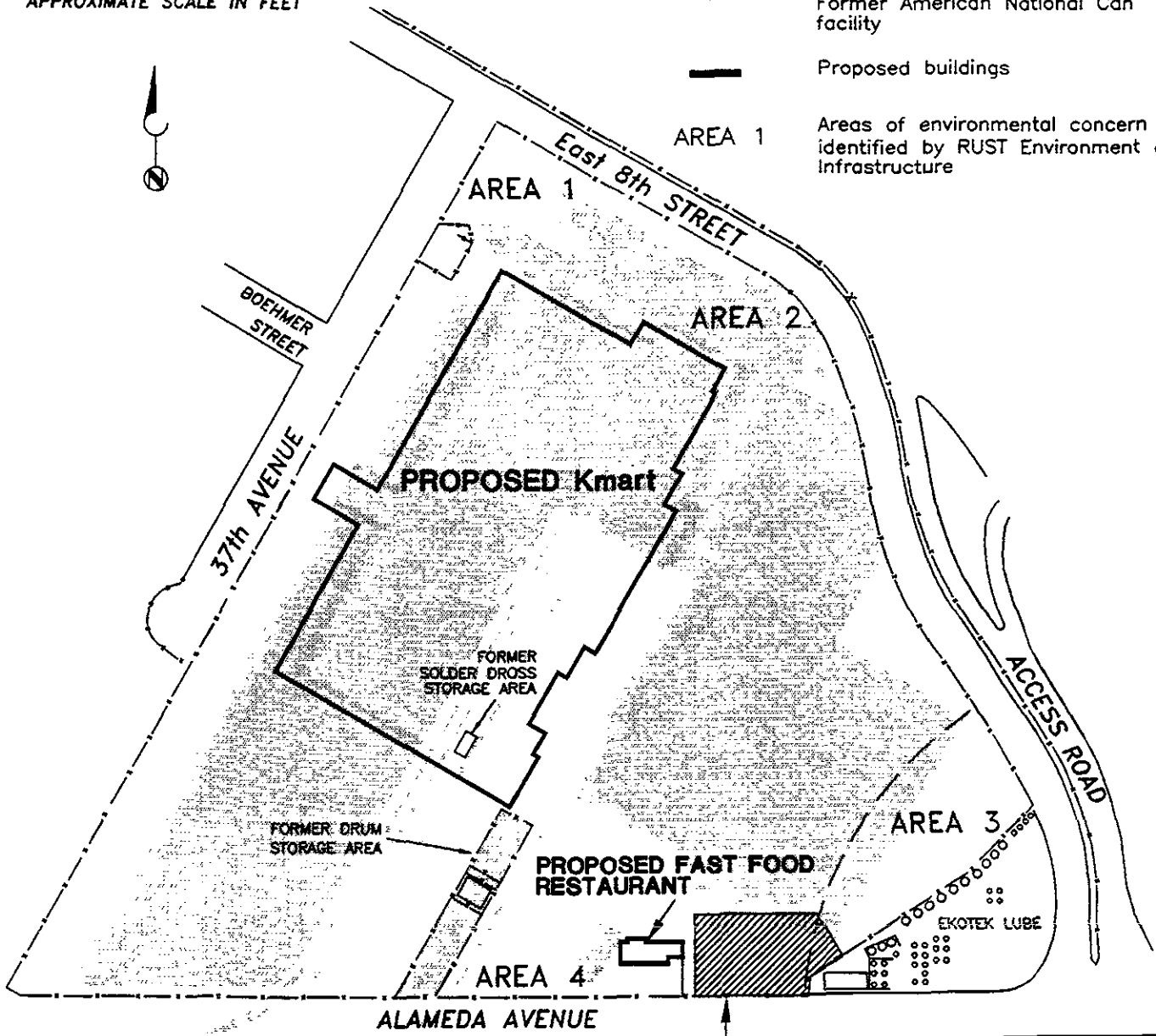
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APPROXIMATE SCALE IN FEET



EXPLANATION

- Former American National Can facility
- Proposed buildings
- Areas of environmental concern identified by RUST Environment & Infrastructure



RAILROAD

Temporary Soil Storage Area



Site Plan
Former American National Can Site
3801 East Eighth Street
Oakland, California

PLATE

2

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DRAWING NUMBER

REVISED BY *jpd*

8/95

DATE

APPENDIX A

MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheet

From Genium's Reference Collection
 Genium Publishing Corporation
 1145 Catalyn Street
 Schenectady, NY 12303-1836 USA
 (518) 377-8855



GENIUM PUBLISHING CORP.

No. 624

NAPHTHALENE

Issued: November 1987



SECTION 1. MATERIAL IDENTIFICATION

24

Material Name: NAPHTHALENE

Description (Origin/Uses): Used as a moth repellent and in many industrial processes.

Other Designations: Naphthalin; Naphthene; Tar Camphor; C₁₀H₈;
 NIOSH RTECS No. QJ0525000; CAS No. 0091-20-3

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyer's Guide* (Genium ref. 73) for a list of suppliers.

HMIS
 H 2
 F 2 R 1
 R 0 I 4
 PPG* S 1
 *See sect. 8 K 2

SECTION 2. INGREDIENTS AND HAZARDS

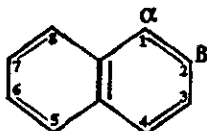
Naphthalene, CAS No. 0091-20-3

ca 100

EXPOSURE LIMITS

IDLH* Level: 500 ppm

ACGIH TLVs, 1987-88
 TLV-TWA: 10 ppm, 50 mg/m³
 OSHA PEL
 8-Hr TWA: 10 ppm, 50 mg/m³
 Toxicity Data**
 Child, Oral, LD₅₀: 100 mg/kg
 Man, Unknown, LD₅₀: 74 mg/kg
 Rat, Oral, LD₅₀: 1250 mg/kg



*Immediately dangerous to life and health

**See NIOSH RTECS for additional data with references to irritative, mutagenic, reproductive, and tumorigenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 424°F (218°C)

Vapor Density (Air = 1): 4.4

Vapor Pressure: 0.087 Torr at 77°F (25°C)

Water Solubility: Insoluble

Specific Gravity (H₂O = 1): 1.162 at 68°F (20°C)

Melting Point: 176°F (80°C)

Molecular Weight: 128 Grams/Mole

% Volatile by Volume: ca 100

Appearance and Odor: White crystalline flakes; strong coal tar odor.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

174°F (79°C) OC; 190°F (88°C) CC

979°F (526°C)

% by Volume

0.9

5.9

Extinguishing Media: Use water spray, dry chemical, or carbon dioxide to fight fires involving naphthalene. Caution: Foam or direct water spray applied to molten naphthalene may cause extensive foaming.

Unusual Fire or Explosion Hazards: Naphthalene is a volatile solid that gives off flammable vapor when heated (as in fire situations). This vapor is much denser than air and will collect in enclosed or low-lying areas like sumps. In these areas an explosive air-vapor mixture may form, and extra caution is required to prevent any ignition sources from starting an explosion or fire.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Naphthalene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.

Chemical Incompatibilities: Naphthalene is incompatible with strong oxidizing agents, chromic anhydride, and mixtures of aluminum trichloride and benzoyl chloride.

Conditions to Avoid: Ignition sources like open flame, unprotected heaters, excessive heat, lighted tobacco products, and electric sparks must not occur in work areas where naphthalene vapor may become concentrated.

Hazardous Products of Decomposition: Toxic gases like carbon monoxide are produced during fire conditions. Irritating, flammable vapor forms below the melting point because even solid naphthalene has a significant vapor pressure.

SECTION 6. HEALTH HAZARD INFORMATION

Naphthalene is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: Renal shutdown (kidney failure), hemolytic effects (breakdown of red blood cells), hematuria (blood in the urine), oliguria (low volume of urine), jaundice, eye damage, and depression of the central nervous system (CNS) are the primary health concerns associated with exposure to naphthalene. The ACGIH TLVs in section 2 are set to prevent eye damage. These recommended exposure limits may not be low enough to prevent blood changes in genetically hypersensitive individuals.
Medical Conditions Aggravated by Long-Term Exposure: Diseases of the blood, liver, and kidneys. Administer medical exams emphasizing these organs. **Target Organs:** Eyes, skin, kidneys, liver, blood (red blood cell effects), and CNS.
Primary Entry: Inhalation, skin contact. **Acute Effects:** Inhalation of naphthalene vapor causes excitement, confusion, headache, nausea, and loss of appetite. **Chronic Effects:** Increased incidence of cataracts.

FIRST AID

Eye Contact: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes to remove particles.
Skin Contact: Immediately wash the affected area with soap and water.
Inhalation: Remove victim to fresh air; restore and/or support his breathing as needed.
Ingestion: Call a poison control center. Never give anything by mouth to someone who is unconscious or convulsing. Administer a gastric lavage followed by saline catharsis. Monitor blood and electrolytic balance. Other sources recommend giving the victim several glasses of water to drink.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all ignition sources immediately. Cleanup personnel need protection against contact and inhalation of vapor (see sect. 8). Contain large spills and collect waste. Use nonsparking tools to place naphthalene into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.
Waste Disposal: Consider reclamation, recycling, or destruction rather than disposal in a landfill. Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Air Contaminant (29 CFR 1910.1000, Subpart Z)

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste, No. U165

CERCLA Hazardous Substance, Reportable Quantity: 100 lbs (45.4 kg)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Follow the eye- and face-protection guidelines of 29 CFR 1910.133. **Respirator:** Use a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* (Genium ref. 88) for the maximum-use concentrations and/or the exposure limits cited in section 2. Respirator usage must be in accordance with the OSHA regulations of 29 CFR 1910.134. IDLH or unknown concentrations require an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres.
Other Equipment: Wear impervious gloves, boots, aprons, gauntlets, etc., as required by the specific work environment to prevent skin contact. **Ventilation:** Install and operate general and local maximum explosion-proof ventilation systems of sufficient power to maintain airborne levels of naphthalene below the OSHA PEL standard cited in section 2. **Safety Stations:** Make eyewash stations, washing facilities, and safety showers available in areas of use and handling. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove and launder contaminated clothing before wearing it again; clean this material from shoes and equipment.
Comments: Practice good personal hygiene; always wash thoroughly after using this material. Keep this material off of your clothing and equipment. Avoid transferring this material from hands to mouth while eating, drinking, or smoking. Do *not* smoke, eat, or drink in any immediate work area. Avoid inhalation of vapor!

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage Segregation: Store naphthalene in a cool, dry, well-ventilated area away from chemical incompatibles (see sect. 5).
Special Handling/Storage: Protect containers from physical damage. All bulk storage facilities must be built with an explosion-proof design. All containers used in shipping/transferring operations must be electrically grounded to prevent static sparks. Use monitoring equipment to measure the extent of vapor present in any storage facility containing naphthalene because of potential fire and explosion hazards.
Comments: All operations with naphthalene must be done carefully to prevent accidental ignition of its flammable/explosive vapor. If the weather is warm, more naphthalene vapor forms and the potential for explosion increases. Do *not* smoke in any use or storage area!
Transportation Data (49 CFR 172.101-2)
DOT Shipping Name: Naphthalene
DOT Hazard Class: ORM-A
IMO Class: 4.1
DOT ID No. UN1334
IMO Label: Flammable Solid
DOT Label: None

References: 1, 2, 12, 73, 84-94, 103. PJI

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Approvals

Indust. Hygiene/Safety *[Signature]*

Medical Review *[Signature]*

**Section 1. Material Identification**

Tetraethyl Lead [(C₂H₅)₄Pb] Description: Derived by alkylation of lead-sodium alloy with excess ethyl chloride in a nitrogen atmosphere or electrolysis of an ethyl Grignard reagent with an anode of lead pellets. Used as anti-knock agent in gasoline aviation fuel. Formerly used in organomercury fungicides and in the manufacture of other metal alkyls such as ethyl mercury compounds. Since 1974 its use in gasoline was largely replaced by methyl tert butyl ether (MTBE), see *Genium* MSDS No. 735] after the USEPA issued regulations requiring its gradual reduction in gasoline. Du Pont was the last known company to produce TEL in the US and stopped production in 1990. There are still US companies with branches in Canada that continue to manufacture tetraethyl lead since it is still widely used in gasoline there and in Europe.

Other Designations: CAS No. 78-00-2, TEL, NCI-C54988, tetraethyl plumbane.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*⁽⁷³⁾ for a suppliers list.

Cautions: Tetraethyl lead is highly toxic to the central nervous system (CNS). The liquid and vapor are easily absorbed through the skin because of TEL's lipid solubility. It is a combustible liquid and can decompose explosively if exposed to air.

R	3		NFPA
I	4		
S	-*		
K	1		
* Skin absorption			
HMIS			
H		3†	
F		2	
R		3	
PPE-Sec. 8			
† Chronic effects			

Section 2. Ingredients and Occupational Exposure Limits

Tetraethyl lead, ca 98%. Impurities include ethylene dibromide, ethylene dichloride, dye (red, blue, orange), and kerosene.

1991 OSHA PEL (Skin)
8-hr TWA: 0.075 mg/m³

1992-93 ACGIH TLV* (Skin)
TWA: 0.1 mg/m³

1985-86 Toxicity Data†

Human, unreported route, TD₁₀: 1.47 mg/kg; toxic effects not yet reviewed.

1990 IDLH Level
40 mg/m³

1990 DFG (Germany) MAK (Skin)
TWA: 0.01 ppm (0.075 mg/m³)

Rat, oral, LD₅₀: 12.3 mg/kg caused aggression, altered sleep time, and convulsions or effect on seizure threshold.

1990 NIOSH REL (Skin)
10-hr TWA: 0.075 mg/m³

Category II: substances with systemic effects
Half-Life: < 2 hr
Peak Exposure Limit: 0.02 ppm, 30 min average value, 4/shift

Rat, inhalation, LC₅₀: 850 mg/m³/1 hr; toxic effects not yet reviewed

Rat, oral, TD₁₀: 7.5 mg/kg administered from 12 to 14 days of pregnancy caused post-implantation mortality or effects on the developing fetus.

* Biologic monitoring is essential for personnel control.

† See NIOSH, RTECS (TP4550000), for additional reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: ~ 392 °F (200 °C); decomposes

Water Solubility: Insoluble, 0.29 mg/L at 77 °F (25 °C)

Freezing Point: -214.2 °F (-136.8 °C)

Other Solubilities: Soluble in benzene, diethyl ether, gasoline, and petroleum ether. Slightly soluble in alcohol.

Molecular Weight: 323.45

Vapor Pressure: 0.2 mm Hg at 68 °F (20 °C); 1 mm Hg at 101.12 °F (38.4 °C)

Specific Gravity: 1.59 at 51.8 °F (11 °C)

Saturated Vapor Density (Air = 1.2 kg/m³): ~ same as air

Ionization Potential: 11.10 eV

Relative Evaporation Rate: 0.032 g/m² at 68 °F (20 °C) and wind speed of 4.5 meter /second

Surface Tension: 28.5 dyne/cm

Refraction Index: 1.5198 at 68 °F (20 °C/D)

Viscosity: 0.864 mPa.s at 68 °F (20 °C)

Appearance and Odor: Colorless liquid which may be dyed orange, red, blue or other color and has a slight musty odor.

Section 4. Fire and Explosion Data

Flash Point: 200 °F (93.3 °C), CC; 185 °F (85 °C), OC | Autoignition Temperature: None reported | LEL: 1.8% v/v | UEL: None reported

Extinguishing Media: A Class III B combustible liquid. For small fires, use dry chemical, carbon dioxide, water spray, or regular foam. For large fires, use water spray, fog, or regular foam.

Unusual Fire or Explosion Hazards: Container may explode in heat of fire (> 80 °C). Tetraethyl lead burns as an orange flame with a green margin and gives off extremely poisonous lead fumes.

Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing is not effective for tetraethyl lead fires. Use clothing specifically recommended by manufacturer (be aware that these may or may not provide thermal protection). Apply cooling water to sides of fire-exposed containers until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if this is impossible, withdraw and let fire burn. Do not release runoff from fire control methods to sewers or waterways. Evacuate 1/3 mile radius if fire becomes uncontrollable.

Section 5. Reactivity Data

Stability/Polymerization: TEL decomposes slowly at room temperature and rapidly at 125 to 150 °C. It also decomposes when exposed to sun or allowed to evaporate in air. Exposure to air for several days can cause explosive decomposition. Hazardous polymerization cannot occur.

Chemical Incompatibilities: TEL solubilizes fatty materials and has solvent action on rubber. It is incompatible with strong oxidizers, sulfuryl chloride, potassium permanganate, and rust.

Conditions to Avoid: Exposure to heat, ignition sources, sunlight, air, strong oxidizers, and other incompatibles.

Hazardous Products of Decomposition: Thermal oxidative decomposition of TEL can produce carbon dioxide (CO₂) and toxic lead (Pb) fumes.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,⁽¹⁶⁴⁾ NTP,⁽¹⁶⁹⁾ and OSHA⁽¹⁶⁴⁾ do not list tetraethyl lead as a carcinogen. One study showed liver and blood tumors (Hodgkins disease) in mice, termed unreliable because these tumors tend to occur spontaneously at times in this particular strain of mice.

Summary of Risks: Do not confuse the effects of tetraethyl lead (TEL) with those caused by inorganic lead exposure. TEL is organic and while both are water insoluble, TEL is lipid soluble and easily enters the as brain while inorganic lead compounds can't. Neurologic symptoms are more prevalent than any others. Tetraethyl lead has a latency period from exposure time to onset of symptoms as it must first be metabolized to triethyl lead before toxicity results. The greater the exposure concentration, the faster symptoms develop. TEL's ability to produce chronic toxicity has been debated for years as is the efficacy of chelation therapy. Chronic toxicity was thought not to occur with organic lead compounds because they did not accumulate in the bone like inorganic lead.

Continue on next page

Section 6. Health Hazard Data

Recently, studies showed that TEL is first metabolized to triethyl lead, then over a period of months, converted to inorganic lead which is then deposited in bone. At this point chronic effects could resemble those caused by direct exposure to inorganic lead. If victim survives an acute exposure, recovery may take weeks to months. It is questionable whether all changes are reversible following heavy or long-term exposures. Teratogenic effects may occur; a syndrome with severe mental retardation has been seen among children of heavy gasoline sniffers.⁽¹³⁶⁾

Medical Conditions Aggravated by Long-Term Exposure: Mental disorders and hypertension. **Target Organs:** CNS, cardiovascular system, eyes, liver, kidneys. **Primary Entry Routes:** Eye, skin, inhalation, ingestion. **Acute Effects:** The primary target organ is the brain, and CNS effects occur in three categories; mild, moderate, and severe. Mild effects include anxiety, irritability, insomnia, lurid dreams, vomiting, metallic taste, paleness, cerebellar ataxia, and diarrhea. Moderate effects are disorientation, hyperexcitability, tremors, chorea (involuntary incoordination of face and limbs), bradycardia (slow heart action), hypotension (abnormally low blood pressure), and hypothermia (lowered body temperature). Severe symptoms include delusions, hallucinations, mania, convulsions, cerebellar edema (fluid in the brain), coma, and death. Ringing in the ears, impaired vision (due to weakening of the eye muscles), elevated liver enzymes, and anemia may also occur. **Chronic Effects:** May occur once TEL is metabolized to inorganic lead. Symptoms include anemia, appetite loss, weakness, insomnia, muscle and joint pain, and colic accompanied by severe abdominal pain. See *Genium* MSDS No. 713.

FIRST AID **Eyes:** Do not allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. Induce vomiting *only* if large amounts are ingested. **Note to Physicians:** Urine lead levels are better indicators of exposure than blood lead levels. Blood lead levels may not reflect exposure until toxicity is severe where as urine directly reflects amount of exposure. In severe acute toxicity, urine lead levels are usually > 350 µg/L but blood levels are < 50 µg/L. Chelation therapy can be useful for chronic exposure but not for acute. If blood levels are greater than 50 µg/dL begin chelation therapy with BAL, calcium EDTA, or D-penicillamine

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. For small spills, take up with earth, sand, vermiculite or charcoal absorbent (decreases evaporation) and place in suitable containers. Dike far ahead of large spill, neutralize with agricultural (slaked) lime, sodium bicarbonate, or crushed limestone and adjust to pH 7. Investigate reclamation or disposal. Follow applicable OSHA regulations (29 CFR 1910.120). **Ecotoxicity Values:** Bluegill, TLm = 2, 1.4, and 0.2 mg/L at 24, 48, and 96 hr, respectively. **Environmental Degradation:** In the atmosphere, TEL rapidly degrades by reaction with photochemically produced hydroxyl radicals and ozone molecules. The half-life is ~ 1.5 to 5 hr depending on solar intensity. In water, volatilization is expected. Half-life from a model river is 5.3 hr and 3 days in a model pond. It is also subject to hydrolysis and direct photolysis. Some TEL may degrade into dialkyl and trialkyl lead which may be more resistant in water than TEL itself. Bioaccumulation may occur in aquatic organisms. If released to soil, some TEL is expected to degrade to water soluble compounds and leach, although some may volatilize or undergo direct photolysis if exposed to sunlight. **Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed (as lead compounds) as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a SARA Extremely Hazardous Substance (40 CFR 355), TPQ: 100 lbs
Listed as a RCRA Hazardous Waste (40 CFR 261.33): P110
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 10 lb (4.54 kg) [* per RCRA, Sec. 3001 & CWA, Sec. 311 (b)(4)]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 0.75 mg/m³, use any supplied-air respirator (SAR) or SCBA. For < 1.875 mg/m³, use any SAR operated in continuous-flow mode. For < 3.75 mg/m³, use any SCBA or SAR with a full facepiece or a SAR with a tight fitting facepiece operated in continuous-flow mode. For < 40 mg/m³, use any SAR operated in pressure-demand or other positive pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. **Warning!** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. If respirators are used, OSHA requires a respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Do not use rubber as material for PPE (TEL may degrade rubber). **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into work area by controlling it at the source.⁽¹⁰³⁾ **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove this material from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in a cool, dry, dark, well-ventilated area (equipped with an automatic sprinkler system) away from heat, ignition sources, and incompatibles (Sec. 5). Keep containers tightly closed; exposure to air can lead to explosive decomposition. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. Use nonsparking tool for any maintenance procedures. **Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers with emphasis on the CNS, including personality changes. For greater assurance of individual protection, monitor urinary output of exposed workers.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Tetraethyl lead, liquid
DOT Hazard Class: 6.1
ID No.: NA1649
DOT Packing Group: I
DOT Label: Poison, Flammable liquid
Special Provisions (172.102): —

Packaging Authorizations
a) Exceptions: None
b) Non-bulk Packaging: 173.201
c) Bulk Packaging: None

Quantity Limitations
a) Passenger Aircraft or Railcar: Forbidden
b) Cargo Aircraft Only: Forbidden
Vessel Stowage Requirements
a) Vessel Stowage: E
b) Other: 40

MSDS Collection References: 23, 73, 89, 101, 103, 124, 126, 127, 132, 136, 140, 148, 149, 153, 159, 162, 163, 164, 167, 174, 175
Prepared by: M Gannon, BA; Industrial Hygiene Review: PA Roy, MPH, CIH; Medical Review: AC Darlington, MPH, MD



Section 1. Material Identification

Di(2-ethylhexyl)phthalate (C₂₄H₄₀O₂) Description: Prepared by acid-catalyzed reaction of 2-ethylhexanol with phthalic anhydride. Used in plasticizing a variety of polymeric materials such as natural rubber, synthetic rubber, nitrocellulose, ethyl cellulose, cellulose acetate butyrate, polymethyl methacrylate, polyvinyl butyral, polyvinylidene chloride, and polystyrene; as an organic pump fluid; as a testing agent for air filtration systems, a component of dielectric fluids in electrical capacitors, an inert ingredient in pesticide formulations; in liquid soaps, detergents, rubbing alcohol, decorative inks, lacquers, photographic film, wire and cable, adhesives, industrial and lubricating oils, munitions, and defoaming agents used during paper and paperboard manufactures.

Other Designations: CAS No. 0117-81-7, 1, 2-benzenedicarboxylic acid bis(2-ethylhexyl) ester, DEHP, di-sec-octyl phthalate, dioctyl phthalate, DOP, octyl phthalate.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*^(TM) for a suppliers list.
Cautions: Di(2-ethylhexyl)phthalate is a possible human carcinogen. Di(2-ethylhexyl)phthalate is a mild skin, eye, and mucous membrane irritant. It affects the gastrointestinal (GI) tract.

R	0
I	2
S	2
K	1

NFPA

 HMIS
 H 0
 F 1
 R 0
 PPG*
 * Sec. 1

Section 2. Ingredients and Occupational Exposure Limits

Di(2-ethylhexyl)phthalate, ca 100%

1989 OSHA PEL
8-hr TWA: 5 mg/m³

1990-91 ACGIH TLVs
TWA: 5 mg/m³
STEL: 10 mg/m³

1988 NIOSH REL
Reduce to lowest feasible limit

1985-86 Toxicity Data*

Man, oral, TD_{Lo}: 143 mg/kg ingested produces gastrointestinal effects
Rat, oral, LD₅₀: 30600 mg/kg
Rabbit, skin, LD₅₀: 25 gm/kg; toxic effects not yet reviewed

* See NIOSH, RTECS (T10350000), for additional irritative, mutative, reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 446 °F (230 °C) at 5 mm Hg
Melting Point: -58 °F (-50 °C)
Vapor Pressure: 1.32 mm Hg at 392 °F (200 °C)
Vapor Density (Air = 1): 16
1 ppm = ~15.94 mg/m³

Molecular Weight: 390.54
Specific Gravity (20°C/20°C): 0.9861
Water Solubility: <0.01% in water at 77 °F (25 °C)
Viscosity: 81.4 centipoise at 20 °C
Pour Point: -50.8 °F (-46 °C); 8.2 lb/gal at 20 °C

Appearance and Odor: Light colored liquid with a slight odor.

Section 4. Fire and Explosion Data

Flash Point: 420 °F (215 °C), OC | Autoignition Temperature: 735 °F (390 °C) | LEL: 0.3% v/v at 474 °F (245 °C) | UEL: None reported

Extinguishing Media: Use dry powder, carbon dioxide, or foam to fight a fire involving di(2-ethylhexyl)phthalate. Water or foam may cause frothing.

Unusual Fire or Explosion Hazards: This material offers no unusual fire hazards beyond those encountered with ordinary combustible materials.

Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Be aware of runoff from fire control methods. Do not release to sewers or waterway.

Section 5. Reactivity Data

Stability/Polymerization: Di(2-ethylhexyl)phthalate is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: This OSHA Class III-B combustible liquid is incompatible with strong oxidizing agents.

Hazardous Products of Decomposition: Thermal oxidative decomposition of di(2-ethylhexyl)phthalate can produce acrid smoke and fumes including carbon dioxide and carbon monoxide.

Section 6. Health Hazard Data

Carcinogenicity: The NTP and IARC list di(2-ethylhexyl)phthalate as an anticipated human carcinogen and possible human carcinogen (Group 2B), respectively. Experimental studies show that di(2-ethylhexyl)phthalate has teratogenic effects in laboratory animals.

Summary of Risks: Di(2-ethylhexyl)phthalate is a mild skin and eye irritant. It affects the human gastrointestinal tract since it is absorbed intact from the gastrointestinal tract. However, when administered either intravenously or orally, it is rapidly metabolized to derivatives excreted mainly in urine or bile. Central nervous system (CNS) depression may occur, especially with ingestion of large amounts. Skin sensitization does not occur in humans. Inhalation of any significant amount is probably unlikely due to the low vapor pressure. Di(2-ethylhexyl)phthalate has become an environmental contaminant that may accumulate in the food chain.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Target Organs: Eyes, upper respiratory system, skin, central nervous system.

Primary Entry Routes: Inhalation, ingestion.

Acute Effects: Symptoms of overexposure include conjunctivitis, keratitis (inflammation of the eye's cornea), bronchial irritation, eczema, staggering, abdominal cramps, nausea, and diarrhea. CNS depression—lethargy, drowsiness, staggering, and sleepiness—can result from absorbing large amounts.

Chronic Effects: None reported.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin: Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting*. Consult a physician immediately.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel. Contain and pick up spilled material with some noncombustible absorbent material. For large spills, dike far ahead to contain. Place in appropriate containers for disposal. Prevent losses into the environment whenever possible. Do not release to sewers or waterways. This material degrades in fresh water sediments under aerobic conditions; half-life is ~14 days. It does not degrade under anaerobic conditions. It is readily concentrated by aquatic organisms. Clean up trace residues with water and detergent. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.33); Waste No. U028

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1 lb (0.45 kg) [* per RCRA, Sec. 3001]

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact.

Ventilation: Provide general and local ventilation systems to maintain airborne concentrations below the OSHA PEL and ACGIH TLVs (Sec. 2).

Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰⁹⁾

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in closed containers in a well-ventilated area away from oxidizing agents and heat and ignition sources. To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas.

Engineering Controls: Avoid prolonged or repeated contact with liquid and inhalation of mist or vapors. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Practice good personal hygiene and housekeeping procedures.

Transportation Data (49 CFR 172.101, .102): Not listed

MSDS Collection References: 1-12, 14, 23, 38, 47, 73, 101, 103, 124, 126, 127, 132, 133, 136, 138, 143, 146

Prepared by: MJ Allison, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: AC Darlington, MD; Edited by: JR Stuart, MS

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APPENDIX B

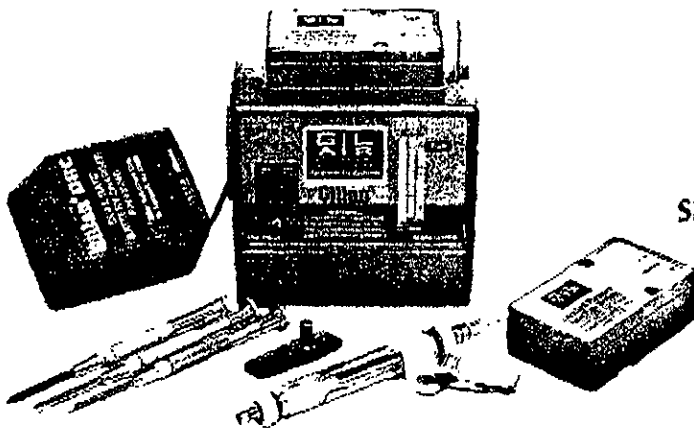
SPECIFICATIONS FOR FIELD SAMPLING EQUIPMENT

GILAIR™ /1 TO 3000 CC/MIN. Particulate/Dust/Gases/Vapors

Compact three-in-one personal sampler for collection of gases, vapors and particulates.

STANDARD FEATURES:

- Constant flow control over the entire range of flow
- Tri-mode sampling operation:
750 cc/min. to 3 Lpm
- Low flow upgrade capability
- Timing upgrade capability
- Pulsation-free flow
- Instant-fault function over entire flow range with constant low flow module
- Compact/ lightweight
- Rechargeable battery pack system
- Standard RFI/EMI shielding case
- Flow-fault indicator, Battery check LED's
- Stainless steel belt-clip
- See-through external filter housing
- Built-in rotameter
- One-year warranty



SPECS:

Triple sampling modes: Constant high flows, 750-3000 cc/min., Pressures to 25" (64 cm) H₂O

Flow control: ± 5% of set point, external flow adjust

Pressure Range:

Flow (LPM)	Fault "H ₂ O	8hr Run"H ₂ O
0.75	25	20
1	35	25
2.5	20	15
3	10	10

Size: 3-9/16" x 3-15/16" x 2"

(9 cm x 10 cm x 5.1 cm)

Weight: 21 oz. (596 g)

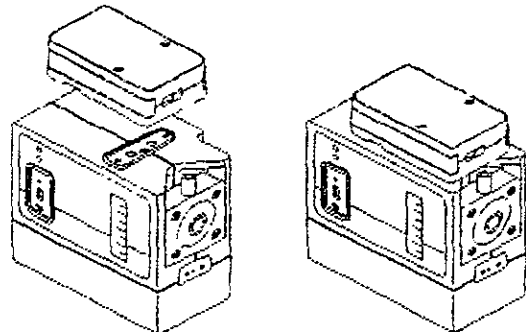
Battery System: Rechargeable NiCad, 4.8 V, 1.4 AH, min. 8 hours operation



ISO 9002

Special GilAir Module Features:

- Easy installation and removal
- Never needs removal for high flow sampling capability
- Interchangeable with GilAir-5
- Bag Sampling Capability



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WELL
EQUIPPED
94



MINIRAM

(Miniature Real-Time
Aerosol Monitor)

MODEL PDM-3

THE WORLD'S SMALLEST, FASTEST, SMARTEST DIRECT READING
MONITOR FOR DUST, SMOKE, FUMES, AND MISTS



- MEAS . . . MINIRAM turns on
- Zero Sets automatic zero
- ID# Programs individual unit identification number, and user selectable functions
- TWA Displays up to the moment time weighted average
- SA Displays shift averaged concentration up to the minute average over 8 hours
- TIME Displays elapsed measurement time
- PBK Plays back stored data
- OFF MINIRAM turns off. Shift or time weighted averages remain in storage for up to 6 months

APPLICATIONS

- Personal exposure monitoring
- Walk-through surveys
- Indoor air quality monitoring
- Time and motion studies
- Workplace monitoring
- Hazardous waste removal surveillance
- Mobile monitoring in vehicles and airplanes
- High level alarming
- Ventilation monitoring

DESCRIPTION

The MINIRAM is an advanced, completely self contained miniaturized real-time monitoring instrument capable of sensing and measuring aerosol concentrations over the range of 0.01 to 100 mg/m³.

Sensing Principle

The MINIRAM incorporates a pulsed near-infrared light emitting diode source, a silicon detector, and collimating and filtering optics to sense the light scattered over the forward angle of 45° to 95° by airborne particles passing through an open sensing volume. The scattering configuration has been designed for preferential response to particles in the size range of 0.1 to 10 μm, ensuring high correlation with standard gravimetric measurements of both the respirable or inhalable fractions.

Passive Air Sampling Method

Air surrounding the MINIRAM passes freely through its open sensing chamber by natural convection and circulation. No pump is required. The MINIRAM operates silently and with minimum battery power. Optional accessories are available for active (with external pump) sampling for concurrent filter collection, extractive sampling, etc. One of the advantages of the nephelometric sensing method of the MINIRAM is that the air velocity through the sensing chamber has no effect on the measured concentration.

Microprocessor Signal Processing

A single-chip proprietary-design microprocessor within the MINIRAM provides unprecedented operational versatility such as automatic zeroing, time-weighted averaging, shift averaging, elapsed time indication, selectable alarm level, data storage, diagnostic indications, etc. The digital readout of the concentration in milligrams per cubic meter is automatic-ranging and is updated every 10 seconds. In addition, the MINIRAM has analog and digital output ports.

Intrinsic Safety Approved

The MINIRAM has been approved by the U.S. Mine Safety and Health Administration for use in coal mines (approval 2G-3532-0) as a permissible personal dust monitor.

SPECIFICATIONS

- Measurement Ranges (auto-ranging):
0.01 to 10 mg/m³
0.1 to 100 mg/m³
- Precision (2-sigma):
± 0.02 mg/m³ (10-sec. measurement at constant temperature)
- Particle Size Range of Max. Response:
0.1 to 10 μm
- Display Selection:
10-second concentration, time-weighted average, 8-hour shift average, elapsed sample time, zero level, ID number, program code
- Data Storage:
7 concentration averages (500 minutes max. each) with timing
- Outputs:
Analog (0 to -1.5V), digital ASCII, switched alarm
- Operating Time:
12 hours (fully charged battery), continuously with included charger
- Operating Temperature:
0 to 50°C (32 to 120°F)
- Dimensions:
10 × 10 × 5 cm (4" × 4" × 2")
- Weight:
0.45 kg (16 oz.)

For further information or a demonstration of the PDM-3
call (617) 275-5444 or write to MIE, Inc. at this address:



213 Burlington Road
Bedford, Massachusetts 01730
Telephone ~~617-275-5444~~ (508) 663-7900
Fax: 617-275-5747

MONITORING INSTRUMENTS for the ENVIRONMENT, INC.

*both.
fr. bi. assistance*

Typical Applications

- Screening waste sites for chemical pollutants
- Groundwater purity testing for volatile organics
- Industrial workplace air quality
- Emergency response
- Fugitive emissions monitoring
- Soil screening
- Health and safety monitoring

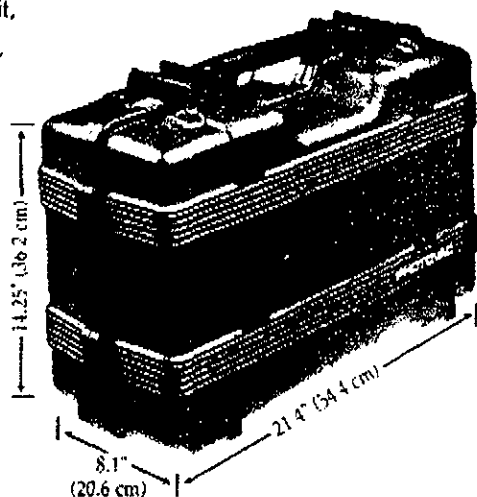
Models Available

- MicroTIP MP-1000 General Purpose Use
Part Number 100033
- MicroTIP HL-2000 UL Classified for Class I,
Division 2, Groups A, B, C, D Hazardous Locations
Part Number 100035

Both models listed on GSA Contract GS00F-2329A.

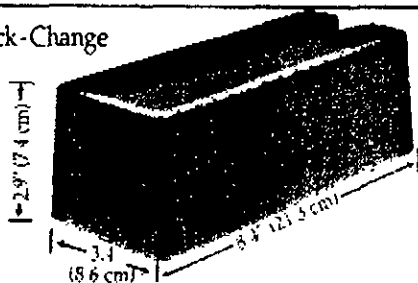
MicroTIP Field Kit includes rugged, high-impact Carrying Case, Calibration Kit, Analog Cable, Printer Cable, and 3-meter Sample Line

Part Number
395008



Rechargeable Quick-Change 7-Hour Snap-on Battery Pack

Part Number
395023



Specifications

Size:	16.8" (43 cm) long, 3.75" (9.5 cm) wide, 5.75" (14.6 cm) high
Weight:	5.25 lbs (2.38 kg)
Detector:	Photoionization, bypass-type, with 10.6 eV UHF-excited electrodeless discharge tube
Keyboard:	16 key silicone with tactile feedback
Display:	2 line, 16 character dot-matrix, liquid crystal with adjustable backlighting, for alphanumeric or bar graph readout
Battery Type:	Sealed lead-acid, field-replaceable pack
Charge/Discharge Time:	8 hour / 7 hour
Battery Charger:	Automatically charges and maintains full charge in battery pack
Datalogging Memory:	25k
Chart Recorder Output:	0-1V full scale
Serial Output:	RS232 (300-19200 baud) with odd, even, or no parity; for tabular and graphic printouts
Audio Output:	Continuous concentration-modulated tone or tone on alarm only
Inlet Connection:	1/8" (3.2 mm) stainless steel compression fitting
Inlet Filter:	Replaceable stainless steel, 2 µm
Inlet Flowrate:	Exceeds 500 mL/min.
Outlet Connection:	1/8" (3.2 mm) stainless steel barb fitting
Materials in Sample Stream:	Stainless steel, Teflon®, Viton®
Operating Temperature Range:	32° F to 105° F (0° C to 40° C)
Operating Humidity Range:	0 to 100% RH (noncondensing)
Operating Concentration Range:	0.1 to 2000 ppm Isobutylene equivalent
Precision:	±1% (100 ppm Isobutylene)
Detection Limit:	0.1 ppm Isobutylene
Response Time:	Less than 3 seconds

Specifications may be revised without notice.

PHOTOVAC

United States
PHOTOVAC INTERNATIONAL INCORPORATED
25-B Jeffryn Boulevard West, Deer Park, NY 11729
Telephone: 516-254-4199 • Fax: 516-254-4284

Worldwide
PHOTOVAC INCORPORATED
99-105 Doncaster Avenue, Thornhill, Ontario, Canada L3T 1L6
Telephone: 416-881-8225 • Fax: 416-881-3961
Telex: (USA) 7608242 - Telex Answerback: PHOTO

APPENDIX C

MASS-BALANCE CALCULATION

MASS-BALANCE CALCULATION

The site action level of 0.8 mg/M^3 was established based upon the following assumptions:

1. The highest concentration of lead detected in the soil within the Temporary Soil Storage Area is 360 ppm.
2. This concentration was converted to a percentage ($360 \text{ ppm} = 0.036\%$).
3. Thus, if the construction dust were present within the air and monitored by the MINIRAM dust/aerosol monitor, the construction dust would contain the worst-case scenario of 0.036% lead. This assumes that all of the lead becomes airborne with the construction dust.
4. The Permissible Exposure Limit (PEL) for lead is 0.05 mg/M^3 . Additionally, the action level for airborne lead exposure is 0.03 mg/M^3 (the point at which some action must be taken in protecting employee from exposure).
5. The next step involves determining what level of construction dust (laden with the worst-case lead level of 360 ppm) would represent an exposure near the lead action level of 0.03 mg/M^3 . This level was calculated to be near 0.8 mg/M^3 .
6. Thus, in this worst-case model, 0.8 mg/M^3 of construction dust within the Temporary Storage Area has the potential to present a lead exposure at the action level of 0.03 mg/M^3 .

Note: These assumptions are based upon the soil sampling and analytical results provided by Rust Environmental within the Temporary Soil Storage Area. These calculations assume that all lead within the soil becomes airborne. There is no proven scientific basis for this calculation, beyond standard mass-balance calculations.

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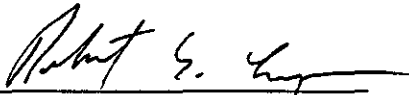
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Robert S. Creps, P.E.
Principal Engineer